

MANUFACTURERS' RECORD

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BALTIMORE, JANUARY 7, 1909.

WE SHALL.

Dr. Andrew Goddard of Waco, Texas,
writes:

Keep on, dear MANUFACTURERS' RECORD,
standing up for Southern manhood, as well
as Southern resources.

WANTS AMERICAN MACHINERY.

Writing from 131 George street,
Edinburgh, Scotland, to the MANUFACTURERS' RECORD, Mr. J. B. Buchin says:

A contractor of my acquaintance has a
contract to move considerable quantities of
soil and sand, and upon my suggestion
wishes scrapers for that purpose, as he has
never seen any. I write to ask you to send
me the advertising sheets of your paper
which show cuts of both scrapers with or
without wheels, and the names of dealers.
If you care to inform the dealers of this
proposed order they could send catalogues
and prices at once and save time.

In a postscript Mr. Buchin adds that
when at home in Beaumont, Texas, he
frequently sent a copy of the MANUFACTURERS' RECORD to the office of the
American consul in Edinburgh, but that
every copy he has sent has been carried
off. In the same mail we have a letter
from Handelshaus, Ingenieur M. Winck-
ler, Moscow, Miassnizkaja 35, in which
he says:

In your edition of the 28th of October we
are pleased to find your note about our look-
ing for business connections with American
firms, for which please accept our best
thanks. The result was a splendid one in-
deed, as we received a lot of interesting
offers which will lead to business.

These letters only illustrate the de-
mand in Europe for information about
American machinery and likewise the
eagerness with which the MANUFACTURERS' RECORD is read in Russia, as well as
in Great Britain, whenever the oppor-
tunity is found.

INFORMATION WANTED.

The Deekle Investment Co., Tampa,
Fla., in a letter to the MANUFACTURERS' RECORD referring to the purchase of 14,000 acres of yellow-pine timber land, writes:

We are going to commence the erection of a saw and planing-mill plant on this timber immediately, or as soon as we can secure the necessary machinery, to get out about 25,000 feet daily, flooring and timber machines, etc. We have also got to buy a 25 to 30-ton locomotive, together with logging trucks, and also from three to five miles of rails, 30 to 40 pounds, for logging purposes. We would be very glad to have you make a note of this in your next issue of the MANUFACTURERS' RECORD, as it will help us considerably in locating such machinery as we will need, and at the same time it will serve as a small news note for your new industries.

John J. Freundlich, general manager
Kentucky & Ohio River Interurban Rail-
road Co., Inc., Paducah, Ky., writes:

I hope that it will not be presuming if we ask you to announce in your columns that some time in the near future we will be in the market for something like 3000 tons 60-pound relaying rails. We ask this favor being aware that your paper, being the largest industrial paper in the South, and appreciating the fact that it is more extensively read, we are confident that we will be placed in communication with parties that it might take some time to meet through the ordinary channels of trade.

J. F. Rudd, president the Utility Man-
ufacturing Co., Kansas City, Mo., writes:

We have been trying for some time to get in touch with a manufacturer who could make taper tubes in one piece, the same to be made from No. 16 gauge sheet steel, 102 inches long, 2 3/4 inches in diameter at the large end and 1 1/4 inches in diameter at the small end, these tubes to be either brazed, electric welded or lock seamed, but as yet we have not been able to find anyone who could do this work. While we only want a dozen for experimental work, the price is no object if it is within reason. Could you put us in touch with some manufacturer who would do this class of work?

These letters are published here to emphasize the fact that news of this kind is desired by the MANUFACTURERS' RECORD at all times and from all places. We want to get the earliest information possible about new enterprises, new construction work, machinery wanted, and all other things which will bring the buyer and the seller of machinery, the owner and the contractor in closer touch. We want every item of news of this kind that can be sent, and we shall always be glad to receive from our readers, whether they be advertisers or not, any information of this character.

OKRA PULP.

The Columbian Paper Co. of Buena Vista, Va., which has been experimenting with okra as a crude pulp material, writes the MANUFACTURERS' RECORD:

The experiments, though somewhat limited, show a very satisfactory fiber from the okra, and it is possible under proper manufacturing processes it might be available for some grades of paper, but it will largely depend upon the cost and quantity produced.

SPECIAL FEATURES IN THIS ISSUE OF MANUFACTURERS' RECORD.

HON. JAMES WILSON, SECRETARY NATIONAL DEPARTMENT OF AGRICULTURE:
In an Interview on Southern Farming.

DR. DAVID T. DAY, UNITED STATES GEOLOGICAL SURVEY:

"Broad Survey of Southern Potentialities in Mineral Development."

JOHN BARRETT, DIRECTOR INTERNATIONAL BUREAU OF AMERICAN REPUBLICS:

"The Meaning of the Panama Canal to the South."

WILLIAM J. OLIVER OF KNOXVILLE, TENN.:

"What Southern Development Means for Construction."

J. T. ODELL OF NEW YORK:

"Problems Fronting Railroads in South Atlantic States."

H. VON SCHON OF DETROIT, MICH.:

"Potentiality of Water-Power Resources of the South."

W. J. MEANY OF BROOKLYN, N. Y.:

"Railroads in the Upbuilding of the South."

EDWARD W. PARKER, UNITED STATES GEOLOGICAL SURVEY:

"The Coal Resources of the Southern States."

CHARLES E. HELLIER, OF BOSTON, PRESIDENT BIG SANDY COMPANY:

"Southern Resources as Related to Two Railroads."

JOSEPH T. TALBERT, VICE-PRESIDENT COMMERCIAL NAT'L BANK OF CHICAGO:

"Chicago Capital Co-operative in Southern Progress."

CHARLES N. GOULD, DIRECTOR OKLAHOMA GEOLOGICAL SURVEY:

"Oil and Gas in Oklahoma."

WALTER PARKER OF NEW ORLEANS:

"New Trade Era for New Orleans."

EDWIN C. ECKEL, LATE OF THE UNITED STATES GEOLOGICAL SURVEY:

"The Delay in Southern Iron Development."

BRECKINRIDGE JONES, PRESIDENT MISSISSIPPI VALLEY TRUST CO., ST. LOUIS:

"St. Louis and the Southwest—Past and Present."

ERNEST F. BURCHARD, UNITED STATES GEOLOGICAL SURVEY:

"Granite and Marble Resources of the South."

MICHAEL HEISTER OF WASHINGTON, D. C.:

"Improvement in Character of Southern Buildings."

COL. HENRY G. HESTER, SECRETARY NEW ORLEANS COTTON EXCHANGE:

"What Shall We Do About Our Cotton?"

ANDREW M. SOULE, PRESIDENT GEORGIA COLLEGE OF AGRICULTURE:

"The Prostitution of Cottonseed."

W. W. DUSON OF CROWLEY, LA.:

"Romance of Louisiana's Rice Fields."

EDWARD WISNER OF NEW ORLEANS:

"Status of Louisiana Swamp Land Reclamation."

ALBERT PHENIS:

"Texas Typical of Southwestern Expansion."

DR. F. W. IHNE, PRESIDENT SOUTHERN GRAPHITE CO.:

"Graphite in the South."

DR. JOHN S. GRASTY OF THE UNIVERSITY OF VIRGINIA:

"Copper Fumes Converted Into a Fertilizer Ingredient."

FRANCIS R. WELLER OF WASHINGTON, D. C.:

"The Value of Southern Water-Power Investments."

JOSEPH HYDE PRATT, STATE GEOLOGIST OF NORTH CAROLINA:

"Good Roads in the South."

W. D. HASTINGS OF COLUMBIA, TENN.:

"Tennessee's Big Phosphate Field."

L. L. HUTCHISON OF THE OKLAHOMA GEOLOGICAL SURVEY:

"Building Stone of Oklahoma."

ALBERT PHENIS:

"Activities Centering in New Orleans' Growth."

AUTHORITATIVE FACTS PROPHECIC OF SOUTHERN PROGRESS.

Hon. James Wilson, Secretary of the National Department of Agriculture, who, in connection with twenty-five other noted authorities, discusses in this week's issue of the MANUFACTURERS' RECORD the resources and progress of the South, taking as his topic farming as the foundation of material progress, says that "in the wonderful progress made throughout the country in agriculture during the last ten or twelve years the South has richly shared." "An immense lot of mortgage indebtedness," he adds, "has been lifted from Southern plantations," and he sees "no reason why the old conditions should ever return." The South, says Secretary Wilson, has a future solidly based on an improving agriculture, and the natural advantages of this section for a profitable agriculture are becoming bet-

ter appreciated every day. Immigration is certain to increase as its advantages become better understood, and more and more will capital seek investment in the South as its advantages are made known to the world. Pointing to the large number of inquiries that come to the department from people of other sections desiring to know where to buy land, Secretary Wilson says: "I remind them that the cheapest lands are now in the South, and that these lands, as a general thing, need nothing but skillful handling to pay well."

Dr. David T. Day of the United States Geological Survey, an expert of world-wide influence, in a most comprehensive discussion of the great wealth of the South in oil, natural gas, sulphur, salt and other minerals, discusses the natural outcome of these conditions in the inevitable development on a large scale of great chemical industries, especially in Southern Louisiana. "It is not too much," he says, "to say that there is no known locality in the world where the natural resources are so combined as to make possible the production of sulphuric acid, soda, caustic soda and similar products at a lower cost than any other place else on earth. * * * Ten times the labor could be profitably employed, the property of the regions mentioned could be greatly developed, and the wealth of all Southern Louisiana placed in a position comparable with the great chemical centers of Europe and beyond any place which could be mentioned in the United States. The development of such industrial enterprises in the near future is a foregone conclusion." He suggests that in considering the development of chemical industries too much emphasis cannot be laid upon their importance if agriculture is to be placed on a permanent basis independent of the richness of the soil. For a supply of potash, a chemical which should find its development in the South, Dr. Day says we must look to the feldspars of the Appalachian Mountain regions, Professor Cushman of the United States Department of Agriculture in his recent wonderful work having shown how these can be applied as a fertilizer. "A suitable supply of nitrogen should," he says, "come first from the complete utilization of all the ammonia from the manufacture of coke, but that still more effective will be the utilization of what is now wasted water-power for the development of cheap electricity along the eastern slope of the Appalachian Mountains, and with this electricity to utilize the nitrogen of the atmosphere to the inestimable benefit of the Southern States." In the development of these great chemical and fertilizer potentialities he says: "We can not only prevent soils from becoming barren, but exhausted soils can be brought again into full fertility, and the old way of allowing the lands to lie fallow can be easily avoided, and any crop can be made successful any year."

Bearing upon water-power resources of the South, Mr. H. von Schon of Detroit says that in our Appalachian regions even under the present uncontrolled regulation of flow and conservation, there is nearly 3,000,000 horse-power available with a natural flow and 5,500,000 horse-power if a portion of the flood waters were conserved, and this list is far from being complete, the rivers in Missouri, Mississippi, Arkansas, Louisiana, Florida, Oklahoma and Texas not being enumerated in this Government report. "This," says Mr. von Schon, "is a startling showing. It should set people thinking and talking about conservation of water-power resources—the people of the South, the owners of this splendid heritage." Discussing the development of electric power, he adds: "Every horse-power thus developed could find its useful work. Transportation would be electrified on rail and canal; electric roads would gridiron the South. Cheap power would displace the wasteful forces, and all the branches of industrial enterprise would experience a mighty stimulus." And Mr. Francis R. Weller of Washington, writing on the value of Southern water-powers as investments, says: "As the growth of manufacturing in this section continues to increase, the enormous potential wealth of undeveloped water-power will become more and more appreciated."

Discussing the coal resources of the Southern States, Mr. Edward W. Parker of the United States Geological Survey says that the South's output of 101,000,000 tons in 1907 "was a little more than one-half the coal production of the entire United States in 1897, only 10 years before. It was nearly 80 per cent. of our total production in 1887, and was more than 1.6 times that of 1880. It was nearly equal to the combined production of Austro-Hungary, France and Belgium, which rank, respectively, as third, fourth and fifth among the coal-producing countries of the world. And one of the Southern States, West Virginia, produced more coal in 1907 than any other country of the world except Great Britain and Germany."

The meaning of the Panama Canal to the South is discussed by Hon. John Barrett, director of the International Bureau of American Republics, formerly Minister to Siam and the Argentina. "The South," says Mr. Barrett, "has become one of the great factors in the growing strength of the nation, and the natural resources there have only begun to be appreciated." Briefly reviewing the foundation of Southern development, he then discusses the territorial extent, the population and the resources of the countries of Central and South America which will be opened up to commerce with the South through the construction of the Panama Canal, and presses upon Southern business men the importance of cultivating the growing trade south of them.

The influence of railroads in the upbuilding of the South is discussed by Mr. W. J. Meany of New York in an elaborate statistical presentation covering the last 20 years, in which he takes the ground that "to keep up with the march of progress the South should build in the next 10 years at least 40,000 miles of new line and increase her auxiliary trackage until its length is one-third as great as that of her main track." Including the building of new lines and the betterment of existing roads, he says: "These necessary additions and improvements will cost not less than \$2,500,000,000, which must come from without the South. To secure such an amount of capital upon any terms competition must be entered into with all the lines of human industry and endeavor throughout the world." What the South may accomplish, richly endowed by nature with wealth-producing capabilities, through the construction of railroads, he illustrates by a comparison of Massachusetts, Pennsylvania, Ohio and Iowa with the Southern States. The four States mentioned have 22 miles of railroad for every 100 square miles of territory. Their combined wealth is \$26,500,000,000, equal to \$1570 per capita. The South, with nearly six times the area and a population 10,000,000 more than the four States mentioned, has total wealth of \$15,500,000,000, or \$570 per capita.

"With the same ratio of mileage and population to territory and wealth of population," says Mr. Meany, "as obtains in the States named, the South would have more than 99,000,000 persons whose wants would be served by 192,000 miles of railroad, and whose combined wealth would amount to \$155,430,000,000. These figures are stupendous, but the construction of railroads has wrought greater wonders than would be then realized in a place as favored by nature as the South."

Mr. J. T. Odell, formerly general manager of the Chesapeake & Ohio Railway, and also of the Baltimore & Ohio, and now an adviser as to railroad matters for large financial interests in New York, discusses the problems confronting railroads in South Atlantic States. He takes the ground that in that region it is necessary that the railroads shall be in a position to spend from \$1,000,000,000 to \$2,000,000,000 for the improvement and modernization of their lines, terminals and equipment within 10 years. An analysis by Mr. Odell of the reports of a number of Southern railroads covering the last seven years convinces him that without the reconstruction or rebuilding of many systems and vast improvement in railroad mileage and roadbed, the business interests of the South would be in a perilous position for lack of adequate transportation facilities. "A simple solution," says Mr. Odell, "of this great problem is that the railroads must be rehabilitated along modern lines, instead of increasing their capacity along antiquated lines. * * * The possible traffic in the South, needing railroad development along thoroughly modern lines, low grades, efficient operation and ample facilities, is almost beyond calculation. Without vastly enlarged railroad facilities and the practical reconstruction of many lines the progress of the South would be almost halted. When this situation is realized, as it soon will be, the problem will be met and solved, but all the energy and co-operative spirit of the people and the railroad powers will be needed in bringing this to pass."

Charles E. Hellier of Boston, largely interested with other Boston capitalists in Southern investments, lays great stress upon the new era in the central South—of Kentucky, Virginia and the Carolinas—by reason of the construction of two roads now nearing completion, from the coal fields of Kentucky and the Virginias to tidewater at Norfolk and South Atlantic ports. He takes the ground that the new line, upon which about \$30,000,000 has been expended, which, in connection with a branch of the Chesapeake & Ohio, will open a direct route from the West to South Carolina, is the most direct line possible from the middle West to the South, and that along this line commerce will flow as naturally as a river in its bed. "When it is realized," says Mr. Hellier, "that this railroad will develop 5,000,000,000 tons of commercial coal in Southwestern Virginia and Eastern Kentucky, it is clear that an event of national importance is taking place, as well as an epochal event in the history of bituminous mining development." This new line will, he says, strengthen the manufacturing interests of the South by furnishing an ample fuel supply of high grade and low cost, and develop "a great tide of travel from the middle West through the South to Florida and Cuba."

Mr. Wm. J. Oliver of Knoxville, widely known for the extent of his operations as a contractor, in discussing what Southern development means for construction work, says: "There are more opportunities offering in the South today in the development line than in perhaps any other section of the universe; yet our section is anything but thickly populated, especially when compared with the New England or middle Western States, although our advantages over these States in practically every feature are manifold. The untouched, undeveloped resources of our Southland guarantees room for all, and when she shall have invested in her transportation facilities approximately \$4,000,000,000, as against \$2,500,000,000 now, and increased her mileage to 100,000, as against some 70,000 at the present time, at the same time increasing the density of her population to equal that of, say, Illinois, we will then begin to have some tangible conception of the magnitude of our section of the country in its relation to the industrial world." "To the contractor Southern development," he adds, "means the highway to prosperity."

In a review of the great tasks for contractors in the South Mr. Edward Ingle, after discussing possibilities of railroad building, water-power utilization, the necessity for electric lines, both city and suburban, presents some facts regarding the reclamation of wet lands in the South and the possibilities of this as illustrated by Holland. The reclaimable land in the South is over 55,000,000 acres, and nearly seven times the area of Holland, and is nearly one-half again as great as the combined area of the six New England States. Based on Government estimates, wet lands of the South would be worth, when reclaimed, at least \$3,300,000,000, or more than the total value of all farm lands and improvements in the whole South eight years ago.

Oklahoma as a center of vast oil and gas operations has been attracting the world's attention for several years, and in discussing this subject Mr. Charles N. Gould, director of the Oklahoma Geological Survey, calls attention to the fact that in 1907 that State ranked first in the production of oil among the States of the Union, with 44,300,000 barrels. The gas field of Oklahoma is, according to Professor Gould, the most extensive so far discovered in the United States, in many cases wells producing anywhere from 10,000,000 to 20,000,000 cubic feet per day, and a number of wells are reported to yield all the way from 50,000,000 to 60,000,000 cubic feet. And yet not 10 per cent. of the region known to be productive has been drilled, and not 10 per cent. of the future known productive region has even been prospected. In addition to oil and gas, Oklahoma is credited with from 6,000,000,000 to 10,000,000,000 tons of bituminous coal.

Great building enterprises, hotels and skyscrapers, an enormous refinery built at a cost of several million dollars to handle over \$50,000,000 worth of sugar a year, are made the basis of a story about New Orleans by Mr. Albert Phenix, in which the growth of that city and of Louisiana is covered, while Mr. Walter Parker, writing of the effect of a constitutional amendment in Louisiana making loans on real estate mortgage collateral free from all taxation, points out the marked effect which this has had upon attracting new capital to that city, resulting in a great increase in building and business operations.

The reasons why the price of cotton has continued low, while corn and wheat are high—a subject of vital interest to the South—are discussed by Henry G. Hester, the secretary of the New Orleans Cotton Exchange, who takes the ground that this is largely due to mistaken legislation from which the farmers of the

South have suffered, and from which the Western farmers have fortunately escaped. No phase of agricultural development in this country is more interesting or more remarkable than that of rice-growing in Louisiana. In a region which 20 years ago was a waste of undrained land, irrigation and reclamation have brought about a rice industry which annually produces more than \$15,000,000, and which has created an estimated wealth in that district of \$200,000,000. Land not salable at even \$1.25 an acre before irrigation and drainage changed that section into a garden spot now costs from \$25 to \$60, and even up to \$125 an acre. Thriving cities have grown up where a few years ago there were but great stretches of wet prairie land. W. W. Duson, to whose work the initial development in irrigation and rice-growing was largely due, in writing on this subject estimates that when the work began some 20 years ago the whole district, now estimated at a valuation of \$200,000,000, was worth approximately \$1,000,000. "Irrigation and drainage," he says, "are responsible directly and indirectly for the other \$199,000,000." The rice mills, the banks, the public buildings, the churches and public schools, says Mr. Duson, are silent witnesses which convince capital what modern methods will do. The prosperous and happy homes, where only the wild duck, the all-

igator, the Creole ponies and cattle lived half a century ago, plead eloquently with the homeseeker to seize his golden opportunity and come to a territory which opens such great possibilities through reclamation for home and money-making.

Texas—imperial in domain and in resources—is, according to the broad survey of the situation by Mr. Albert Phenix, growing steadily and rapidly. "A great deal of immigration is flowing in. There is a remarkable development the whole State over, not only in enterprises, cities and towns, but in farming operations as well. While Texas still produces an enormous cotton crop, sometimes as high as 3,500,000 bales, with a value running at times to nearly \$200,000,000, there is a growing disposition to experiment in all other feasible lines. Alfalfa growing is being extensively and most profitably engaged in. More corn was raised in Texas this year than ever before, the total product being more than 200,000,000 bushels. Industrial interests are expanding, and in the interior, as on the Gulf coast, progress is everywhere in evidence."

But enough. We have culled these brief extracts from a few only of the many special articles in this issue merely to whet the appetite of our readers for the full feast of good things.

WHAT EVERY BUSINESS ORGANIZATION SHOULD DO.

The Rochester Railway & Light Co., Rochester, N. Y., in a letter to the MANUFACTURERS' RECORD, says:

This company is about to issue a general order to its employees, stating that after January 1, 1909, technical publications will be furnished them by their paying one-half the cost. The company feels that there is no expenditure which will give, or has given, a greater return than that which has been made for technical publications.

As your periodical has been selected among others to be placed on the list to be selected from, we now take up the matter of getting your lowest club rate for from 10 to 50 members, to be delivered to the residences of the different employees here at Rochester, N. Y.

This is a wise policy. If the business men and the business organizations of this country would be broad enough in their dealings with their men to encourage them to read the right kind of literature, to study the publications which help to train and educate and make real men, better equipped for work, better equipped for the duties of life, we would hear less of the inefficiency of employees. How many railroad companies, for instance, have, like this Rochester Company, ever undertaken to interest their employees in technical or semi-technical publications dealing with business questions? Some few provide such publications for their leading officers, but even this has not been very general. How many Southern railroad officers, for instance, have ever made the slightest effort to have their men, from the highest to the lowest, keep in close touch with the South's resources and its opportunities, and what it is really doing in development work? How many business houses have ever done the same? Last week the MANUFACTURERS' RECORD published a letter from the Smith-Briscoe Shoe Co. of Lynchburg, Va., in which it said:

We are deeply interested in the work you are doing for the South, and we are trying to impress on everyone connected with the Smith-Briscoe Shoe Co., as well as our twenty-odd salesmen, the importance of becoming enthused over the work you are doing and to interest and influence all the business people we may come in contact with to subscribe for and read the MANUFACTURERS' RECORD.

This policy ought not to be the exception. Every man interested in the welfare of his country, the stability of government, in humanity itself, ought to be an active, vigorous worker in getting people about him and people under him into the habit of reading the best current literature of the day relating to their work, their industry or their country, and thus overcome the growing habit of yellow journalism and the trash of the day, which fills so many news stands with unspeakable books. The Rochester Railway & Light Co. very well expresses the case when it says that it feels there is no expenditure which will give a greater return than the work which it is doing in encouraging its

VISION OF A PROPHET.

More than 25 years ago Henry F. DeBardeleben, one of the leaders in the creation of the iron interests of Alabama in the building of furnaces and the opening of coal mines, blazed a way in which others have followed. In his enthusiasm about this section Mr. DeBardeleben, like many another man whose imagination enables him to look ahead and see beyond the veil through which others could not penetrate, has been counted by some, at least, as visionary. A few weeks ago the Manufacturers' Record asked him to write for this issue a vision of the future in iron and steel, but he declined on account of press of other matters. His very letter of declination, however, is in itself a vision. In that letter he said:

"I would say that for the past five years I've been constantly at work with diamond drill, pick and shovel in the coal and ore fields of this region, and have taken but little interest in keeping up with what was being done in the iron world; consequently I'm too rusty to write an article that would be accurate enough to appear in the Manufacturers' Record."

"We are undergoing a great change; we are at the threshold of a great revival in the industrial district."

"The misfortune of those who held the majority of stock in the Tennessee Company was a godsend to this district. I sympathize with them to the fullest extent, but stock of the Tennessee Company was used as chips for many years, but the poor orphan has at last found a home to rest in."

"We no longer need say that for the want of capital we cannot do that which we would like."

"Birmingham district is truly fortunate; we have the Steel Corporation, being the largest industrial corporation in the world, to lead off and to show how the cheapest structural steel and rails can be made that the world has seen."

"We are nearer to salt water. The day will come when this great company will own its own double track to the Gulf of Mexico. The cost then of a ton of steel on board vessel will be down to the minimum. The difference between actual cost of transportation plus the digging of a ton of metal out of the ground will place this district in command of the export trade from the United States."

"The next great point with us is that we have the greatest railroad man in the world interested in the growth of the district. The purchase by Mr. Harriman of the Illinois Central Railroad and the Central of Georgia Railroad gives us a system with capital enough to build branch lines to duplicate or aid that which has been done and is being done by the Louisville & Nashville."

"In the next few years ahead of us the developments in this region will be so great that even a visionary man, as I am, will be astonished at the result."

people to read the right publications.

Imagine for a moment what it would mean to the South if every business man, every man in official position, every corporation, would recognize the obligation resting upon him to do similar work and help to broaden the knowledge of those about him as to the South, and in this way quicken them into a livelier sense of their opportunities and responsibilities! This would be a work of incalculable value, bettering humanity, rapidly increasing Southern progress and bringing to each individual, corporation or business concern many times the cost. It would be an investment that would pay great dividends. It ought to be counted as a part of the operating expenses of every concern in the South. The claim of business organizations, and especially of railroads and kindred enterprises, that they are not financially able to do this indicates their failure to comprehend the importance of the work and its direct financial value to them.

ACTION FOR WATERWAY IMPROVEMENT DEMANDED NOW.

In 1906 the MANUFACTURERS' RECORD said the Panama Canal would probably cost \$400,000,000 to \$500,000,000. We have seen no reason to change that opinion, but the canal will be worth the price. Suppose, however, we had started building the canal with an appropriation of, say, \$50,000,000, trusting to annual or biennial appropriations to continue the work. After spending the first \$50,000,000 we would then have had to make a new fight every year for an additional appropriation. Some years by hard work Congress might have been induced to vote favorably, but the next year it might for some reason have voted unfavorably, compelling the discontinuance of work for a year or more until additional money could be secured. Can anybody estimate what, under such circumstances, the canal would eventually have cost, or could any man living today expect to live long enough to see it completed and to get

the benefit of the business development which it is to bring to this country if that had been the policy? If it was important that when we entered upon the construction of the Panama Canal it was with the determination not to let up until it had been finished, and with authority from Congress to issue bonds in payment for it, how much more important it is that the improvement of the rivers and harbors of our country should be conducted on a similar line. The Panama Canal, great as will be its value to this country, is not so important as the broad improvement of our waterways. The annual profit to the country in the spending of \$500,000,000 upon the deepening of our rivers to the point where new traffic would be developed and freight rates on heavy materials greatly lessened would be far greater than the profit on the Panama Canal. This country, however, is rich enough to justify both of these important expenditures. The value of the Panama Canal and the necessity for pressing this work to completion, even if engineering changes should be found necessary, are fully recognized by the people of the whole world. Nothing should be permitted to halt the progress of construction. No influence should delay the work. If it is to cost the \$400,000,000 or \$500,000,000 which the MANUFACTURERS' RECORD ventured to suggest three years ago as probable, no one need be alarmed at the figure. Why should we then hesitate and halt when the suggestion is made that Congress authorize an issue of bonds to the extent of \$500,000,000, the proceeds to be used in the improvement of our waterways.

An objection to this has been raised by a banking-house circular on the ground that such an issue of bonds would result in depreciating the selling price of Government bonds now held by national banks, and would thus seriously injure the banking interests of the country. This position is not tenable. The authorization of the bond issue would not mean that the bonds should all be sold at once, but that they would be available from year to year to guarantee the continuation of the work without the necessity of going back to Congress every year and making a new fight for an appropriation. Under the present system the continuation of work is always uncertain, the time of completion is greatly delayed, and the cost is increased. It is hardly conceivable how a people with such boundless resources justifying industrial business growth many times beyond the present and far beyond what it will be possible for railroads to adequately handle in the near future, should delay in providing a bond issue in order that the work may go forward rapidly. No one questions the fact that the net profit to the country in the expenditure of \$500,000,000 in this way would annually be greater

than the total outlay. Railroads are supposed by many to be earning all they are entitled to when they make 5 or 6 per cent. on their investment, but here is a situation in which the people can make an investment and get at least 100 per cent. a year net profit to the country. In reality, it would be larger, for it would bring about a very much broader development of all business interests. The people of the present day would get the benefit, and not leave entirely to future generations all the potentialities which could now be realized to the benefit of the future as well as of the present. Every commercial organization should actively press this upon Congress.

ORDERS FOR CARS AND ENGINES

While the record of railroad construction during 1908 published two weeks ago in the MANUFACTURERS' RECORD reflects very strongly the great depression of business in the transportation world since the panic, the summing up of the orders for new rolling stock throughout the twelvemonths is another equally striking evidence of the large falling off in business experienced by the railroad companies as a result of the financial cataclysm which swept the country a year ago, following a series of attacks upon corporate interests, which unsettled confidence and frightened capital. The *Railroad Age-Gazette* presents a review of car and locomotive orders given during 1908 in the United States and Canada, and showing that a tremendous falling off occurred. The number of locomotives contracted for was less than half the number ordered in any other year since and including 1901, and the number of freight cars ordered was little more than half of the number of them ordered in any other yearly period from 1901 to 1907, inclusive. Here are the figures for the whole country equipment orders during 1908: Locomotives, 1182; passenger cars, 1319; freight cars, 62,609. The lowest number of engines ordered in any other year of the period was 2538 in 1904, and the highest was 6265 in 1905. The lowest number of freight cars ordered in any other year of the series was 108,936 in 1903, and the highest was 341,315 in 1905. The lowest number of passenger cars ordered in any other year since 1901 was 1791 in 1907, and the highest contract orders for 1908 and 1907 was 3459 in 1902. The number of engines and cars built in 1908 exceeded the figures for those built in that year by several hundred locomotives and several thousand cars, the totals being: Engines, 2342; cars, 78,271. These figures also cover Canadian orders.

During the autumn just ended a revival of activity in car and locomotive contracts encouraged the belief that 1909 would be a very busy year with manufacturers of railroad rolling stock, but latterly there has been a decline in the number and volume of such orders, due, in part, at least, to the winter season, when railroad traffic generally declines. Considering all things in the premises, the new year may be expected to show a marked improvement over 1908 in the quantity of cars and engines constructed, as well as ordered, because it will be remembered that the most of the new business secured during the past year was gathered in the last half of the twelvemonth, and much of it is yet to be delivered, while other orders are being taken, in no great quantity as yet, it is true, but in sufficient numbers to afford confidence in the future, provided that the recent hands-off attitude of the politicians toward the railroad

interests is maintained. This the railroads have reason to expect, because they have in large degree found public sympathy for the unjust attacks to which they were subjected, ostensibly for the public good, but not because of any great public need for such legislation as was aimed against them. In contemplating the prospect for new equipment orders it must, however, be borne in mind that the railroads have on hand much comparatively new rolling stock ordered in the busy times, a large part of which has lately been idle.

It is particularly interesting to observe that several of the largest equipment orders lately given were for lines in the South, as, for instance, the Carolina, Clinchfield & Ohio Railway, the Virginian Railway and the Seaboard Air Line. During the year other Southern lines also participated largely in the volume of business secured by the car and locomotive manufacturers, among such roads being the Atlantic Coast Line, the Southern Pacific in Texas and Louisiana, the Georgia & Florida, the International & Great Northern, the Louisville & Nashville, the New Orleans Great Northern and the Western Maryland, besides others. Notwithstanding the depression of 1908, the South built more than half of the new railroad mileage of the country constructed during that period, and it may be expected to do even more than its apparent share in ordering new rolling stock to meet the demands for its development.

There is every reason to look hopefully upon the prospect for 1909. With the Presidential election behind us we have a reasonable assurance of stable conditions for another four years, and already evidences of revived activity in Southern railroad construction are visible from Maryland to Texas and from Florida to Oklahoma. Texas is particularly active in promoting new railway enterprises, at present there being a number under way, but every State has its plans, and, as outlined in the annual review of the MANUFACTURERS' RECORD, the promise is that several thousand miles of new railroad track will be built in the South this year. This means, to return to the keynote of this article, that much new equipment will be required south of the Potomac and the Ohio.

SAVE THE APPALACHIAN FORESTS.

For the past year there has been conducted a campaign of publicity and education in the South that has had to deal with one of the most important matters, if not the largest and most vital problems, that concern intimately every man, woman and child in the South!

This is the work so forcefully and efficiently carried on by the Appalachian National Forest Association in its efforts toward the establishment of the Appalachian Forest Reserve, and toward bringing out the real significance of the critical condition in which the South and the nation find themselves as regards the remaining forests of the country.

A purely voluntary association, organized hastily a year ago in Atlanta, it has accomplished, through the merit of its cause and the earnestness and loyalty of a few men and women who are pledged to the forest cause because of love of the South, the best work perhaps ever done for forest perpetuation in the country.

It has aroused as never before the progressive South to a hearty appreciation of the dangers that menace the South through continued misuse and

abuse of this splendid heritage, the Appalachian Forest. It has rallied to the support of national sanity in respect to our future treatment of them, the aggressive South. It has enlisted in a splendid way the powerful aid of the press of the South. That it will finally win its fight for the forests admits of no question. Aside from this great constructive work accomplished by it, the association has a practical plan for the largest measure of forest perpetuation in its advocacy of the establishment, not only of the Appalachian-White Mountain reserve, but for the early adoption of a definite, systematic and progressive forest policy that would ultimately mean the establishment of Government forests in all sections of the country where they may be constitutionally established, and in its advocacy of the larger and relatively more important work of conserving the forest areas contained in the States that are owned by the individual citizens thereof—this great forest area which, under no possible plan could be purchased by either the National or State government, and which must in some way be saved if we are to avoid National suicide.

This important State work must be undertaken by the States themselves. It involves the establishment of State forests, obtained by gift or purchase, to serve as demonstration farms under an efficient State forest service. It involves some equitable though radical revision of tax laws relating to forest lands, whereby the State, co-operating with the owner, may make it profitable to the owner to hold and rightfully use his timber area. It involves and urgently demands adequate fire protection of all forest lands under State fire wardens, a trained and efficient fire-fighting force under some plan similar to that used in the National forests in the West. It involves such State legislation as will finally induce the individual or corporation to handle his forest holdings in the right way in co-operation and sympathy with the work which the State is doing, or that will compel him to do so, under the theory of sound common sense and sound law, held by the Supreme Court of Maine that the State may, as a duty to itself and its citizens, restrict the cutting of forest areas that are essential to the health or prosperity of the State, where their removal is a harm or menace to either. This is a big conception, but is clearly along lines that are sound and practical, and that in whole or in large part must be carried out promptly. We have reached the danger point already, so that the MANUFACTURERS' RECORD, in endorsing the work done and emphasizing the work to be done, but voices real and indisputable facts.

The work and worth of the Appalachian National Forest Association, standing, as it does, for patriotic and constructive work of the highest character, is such that the South should supply it with the modest financial support required for a vigorous fighting campaign along the lines it advocates in a way that would increase its value and influence a hundredfold and make for the solid accomplishment of all the things for which it stands. Surely in a work of such significance, of such tremendous economic value, of such deep and vital concern, not alone to the South, but, through it, to the whole country, there must be men of the South, having the real need of their South shown to them, who will in generous measure rally to the support of a work so splendidly under way. In no more patriotic or higher way can the South be served than in this, for it is work

that counts not alone for the South of today, but in even larger measure for the South of the future when it shall have come into its own.

WHEN THE SOUTH SHALL BE POWERFUL.

The South is growing and will continue to grow. When it becomes rich and populous it will regain its old-time power and influence in things political and will be the commercial center of the country.—*Lynchburg Advance*.

Exactly. The MANUFACTURERS' RECORD has preached this doctrine for many years. He who does most to aid the material upbuilding of the South through the profitable employment of its people and the utilization of its resources will do the most to advance its educational and religious life and its power for good in statecraft as distinguished from petty politics.

HOW HE LEARNED THE SOUTH.

B. F. Groff, hydraulic and mechanical engineer and contractor, Lancaster, Pa., in subscribing to the MANUFACTURERS' RECORD, writes:

"At this writing I find I have a few spare moments in which to express my ideas in regard to the resources of the South. My attention was first called to your paper several years ago, and since then I have been a constant reader. I had only a faint idea of the resources of the South before reading the columns of the MANUFACTURERS' RECORD. Being engaged in the construction of hydro-electric plants, I found several items in your paper in regard to prospective business in the South, and then made my initial trip to Virginia, and I was more than surprised to note what could be done in the way of harnessing the rivers of that State. There is an eager demand for electric current for lighting and power purposes, and the rivers throughout the South afford a great deal of fall and are usually streams that can be depended upon for a large flow of water throughout the year.

"Had it not been for the MANUFACTURERS' RECORD the writer probably would not have learned of these possibilities. There is a great deal of undeveloped country throughout the South which could be very materially improved, provided they could have access to cheap power, and the development of the rivers for electrical purposes will bring about the development of this country. A great deal of credit must be given your paper, due to the fact that you have brought before the public the great advantages that can be obtained throughout the South.

"The investing public in general only has a faint idea of the possibilities the South affords, and were it possible for you to present each investor with several copies of the MANUFACTURERS' RECORD I believe a great deal of good could be done, and that the attention of New York capitalists would be attracted, and no doubt Northern capitalists would seek investments in the South.

"In my mind, there is no section of country that affords a better opportunity than the field I have just referred to, and the South has all to gain and nothing to lose.

"I find this field a very satisfactory territory for my line of business, and believe that within a short time you will note a decided boom in the South. I have been instrumental in promoting the improvement of several water-powers, and am of the firm belief that we are entering an era of prosperity at the present time. In the event that the MANUFACTURERS' RECORD continues to do the good work along the line it has been doing for a number of years, prosperity throughout the South is sure to come."

Broad Survey of Southern Potentialities in Mineral Development.

By DR. DAVID T. DAY, of the United States Geological Survey.
[Written for the Manufacturers' Record.]

Dr. David T. Day may be regarded as one of the veterans in the service of the United States Geological Survey, with which he has been connected for 25 years. To him was due much of the success of Government exhibits at the Chicago World's Fair, at the Atlanta Cotton States Exposition, the Tennessee Centennial, the Trans-Mississippi Exposition, the Paris Exposition,

the Pan-American Exposition, the Louisiana Purchase Exposition and the Lewis and Clark Exposition. For many years he was the compiler of "Mineral Resources of the United States," published annually by the United States Geological Survey, in which he was long chief of the Mining and Mineral Resources Division.

The South produces more oil than it does milk.

The area of the oil lands in the Southern States aggregates about 1500 square miles. While this is not 20 per cent. of the area of all the productive oil territory in the United States, the South contributed not far from half of the entire production in 1907—that is, 72,000,000 barrels. Further, the territory where the most active prospecting for new oil fields is in progress is in the Southern States, namely, Oklahoma, Louisiana and Texas. Expectancy in this regard centers in Southern Louisiana. Therefore, a short statement of the conditions of the oil industry in the South is of great present interest. The developments are so rapid that one is tempted to wait until the situation is somewhat more cleared up before attempting any adequate description, and the present article is merely a resume of the interesting features of present conditions, which are changing rapidly from month to month. The accompanying table shows the estimated areas in square miles:

Estimated Productive Areas of Natural-gas Territory in Square Miles.			
Alabama.....	40	Oklahoma.....	90
Kentucky.....	290	Texas.....	130
Louisiana.....	110	West Virginia.....	1000
Missouri.....	70		
Total.....			1730

These areas are most definite in Oklahoma, and yet in this very State the prospect of new pools and the extension of old ones is very promising. It is a matter of familiar history how Robert Galbraith in December, 1905, drilled a well south of Tulsa, Okla., in what was then the Creek Nation, and secured a good producer. This led to the development of the Glenn pool, which produced 19,926,995 barrels in 1907. Had his well been drilled a few rods to the east of its actual location the pool would have been missed altogether. Since that time 8000 acres have proved productive in this pool and 1200 wells have been drilled, nearly all of them productive. The area of the pool has been fairly well defined, with possible extensions still to be made on the north; but of great interest within the last year has been the development of a lower sand at several points in the pool, which is also of considerable thickness and a good producer. The conditions in this pool, as well as elsewhere in the State, lead to the belief that the sands occur as individual lenses, sometimes overlapping, as in the Glenn pool. The area of these lenses varies greatly in different parts of the State, and their distribution leads to the belief that many more will be discovered. During 1908 the sensation of the Mid-Continent field has been the extension of the Cherokee, or "Shallow," pool, to the northeast of the Glenn pool. Here wells average not more than 6000 feet deep. A well can be drilled in three days at a cost of not more than \$1000. The oil produced, while not so thin as the Glenn pool, is satisfactory, and, naturally, has been much sought for, until the daily production in October of 1908 had risen to 75,000 barrels.

Great credit is due in this field to the engineering feat of laying two pipe lines in record-breaking time from the Oklahoma field to the Gulf.

The Gulf Pipe Line as at present constructed has six pumping stations, as follows: Watkins and Chambers, in Oklahoma, and Lenoir, Big Sandy, Lufkin and Sour Lake, in Texas. The distance between stations is as follows: Watkins to Chambers, 79 miles; Chambers to Lenoir, 78 miles; Lenoir to Big Sandy, 89 miles; Big Sandy to Lufkin, 82 miles; Lufkin to Sour Lake, 91 miles.

The station at Watkins is of a somewhat temporary character, the pumps in use being simple duplex non-condensing steam pumps of size 18 inches by 5 inches by 18 inches, operated by steam from boilers, the fuel for which is natural gas from the Glenn-pool field.

The station at Chambers is of modern design and construction, having three main pumps, which are triple-expansion, duplex condensing, size 11 inches by 17 inches by 28 inches by 5½ inches by 24 inches. They are operated by steam from boilers, the fuel for which is bituminous coal.

The stations at Lenoir, Big Sandy and Lufkin, Texas, are alike in construction. In each station are four units of Gould's triplex power pumps, whose plungers are 5¼ inches by 16 inches. Each of these pumps is operated by a Hornsby-Akroyd oil engine of single-cylinder type, each of nominal capacity of 90-horse-power and each operated by crude oil as fuel.

Two 37,500-barrel working tanks are located at each of the four last-mentioned pumping stations.

At Sour Lake connection is made with the Gulf Pipe Line Company's 6-inch lines from Sour Lake to the Gulf Refining Company's refineries and docks at Port Arthur, Texas, 34½ miles distant.

The station at Sour Lake not only serves the purpose of pumping oil for the through pipe-line system, but also for local lines of the company in the State of Texas. The pumps in use at Sour Lake are duplex compound condensing, operated by steam boilers, for which crude oil is used for fuel.

The capacity of the main line, with pumping stations as at present located and equipped, is 14,000 barrels daily. The main 8-inch line from Watkins to Sour Lake is almost an air line, with but few deflections. The work of pipe-laying was started February 13, 1907, and was completed August 13, 1907, exactly six months later. The first oil was pumped from Watkins station, in the Glenn pool, August 15, 1907. The country traversed presented a number of difficult and peculiar engineering problems. A spur of the Ozarks, 1200 feet high, had to be crossed, and for miles through this section there was no soil, the ditch being blasted into solid rock. The rainiest winter for years caused serious inconvenience, and numerous shallow prairie streams delayed the construction until enough pipe lengths could be screwed together on the near shore, a windlass rigged up on the far shore and the jointed sections pulled across the stream. Streams like the Neches River and Sulphur Creek were spread over bottoms

miles wide. The directness of the course adopted required the hauling of practically all of the pipe from railroad unloading stations for distances in some cases as much as 20 miles, and in many instances the heavy sections of pipe, weighing 600 pounds each, had to be carried long distances on the shoulders of the laborers, owing to the roughness of the country traversed. The location of pumping stations at approximately equal distances apart, adjacent to water supply and at the proper elevation, involved unusual engineering skill.

More than 1500 laborers, divided into 10 groups, were employed in the work. A schedule of more than two miles per day was figured out in advance, and so accurate was the estimated rate of progress that when the gaps were closed up it was found that the various gangs of workmen had finished their work with an average difference of time as compared with the schedule of not more than four days.

The rate of flow of the oil in the line is such that but for the necessity of relaying at the intermediate stations only 10 days would be required to transport it from one end of the pipe line to the other; one additional day for relaying at each station brings the total up to 15 days.

The 8-inch pipe line of the Texas company begins at Tulsa and passes through Henryetta, Stuart and Armstrong, Okla.; it crosses the Red River at Denison and continues thence to Sherman, Dallas, Corsicana, Concord, Bobbin and Humble, Texas. At Humble it connects with the 6-inch system from that point to Port Arthur and Port Neches. This line takes in Dayton, Sour Lake, Beaumont and Nederland. The line was commenced early in February, 1907, and completed in January, 1908. Its daily capacity is from 17,000 to 18,000 barrels. At all of the trunk-line stations there are at least two 37,500-barrel tanks. At Tulsa there are 32 of these tanks, at Dallas 14, at Corsicana 3, at Humble 5, at Sour Lake 7, at Beaumont (Garrison) 14 and at Nederland 12. In addition to this, there are a large number of tanks connected with the refineries at Dallas, Port Arthur and Port Neches.

This pipe-line development, enabling the oil refiners at the Gulf ports to substitute the lighter Mid-Continent oil for the Texas product, has been, of course, a disadvantage to the Texas producers who formerly sold for refining purposes, and has been a boon to the railroads as insuring to them more permanence for locomotive use from the declining Texas supply. The conditions in which oil is found in Texas are peculiar and interesting. Seepages of oil, asphalt and natural gas are so common in Texas as to tempt "wild-cattin'" under all kinds of geological conditions, and has led to the formation of more oil companies than there are oil wells. The drilling of the Lucas well at Spindle Top, near Beaumont, in 1901, directed attention to such oil seepages as were found escaping from the low "mounds" so frequently encountered in the Gulf region of Texas and Louisiana, and also Mexico. These "mounds," not usually more than 10 feet above the general plain, show a geologic structure entirely different from the surrounding country. Here the drill penetrates, in addition to the usual succession of sand, limestone and "gumbo" clay, strata containing more or less sulphur, or iron pyrite, or both. Natural gas with greater or less pressure is met with at frequent intervals, and a common characteristic is rock salt, encountered at irregular depths and of irregular thickness, in the course of the drilling of these wells. Transfer the location of the well a few rods off the "mound" and the drill will reach the limit of profitable work without striking all the features characteristic of the "mounds." The strata which thus characterize these peculiar formations dip within a few rods inaccessibly deep under the surface clays and sands. As stated, an elevation of 10 feet, sometimes more and sometimes less, is all that characterizes the surface where these "mounds" are observed. Therefore, it is not likely that a large proportion of the "mounds" existing have been located up to the present, and, while many will prove barren, the prospect of more oil pools of a similar character in Texas is good.

Meantime in Northern Texas oil is found under a different condition of things, and, while the pools are less easy to locate, they are more enduring when found. The probability of large gas fields in the northern part of the State was also increased both by the discovery of the Caddo field in Louisiana, and, more recently, the drilling in of a well yielding 25,000,000 cubic feet of gas per day, 150 miles west of the Caddo (La.) pool, and justifying considerable attention to this part of the State. Such a gas field means less satisfaction to the seeker for oil, but greater prosperity to the region, because of the ease with which manufacturing is developed where this ideal fuel abounds. In Louisiana the "mounds" characteristic of oil production in Southeastern Texas extend to the east beyond Belle Isle, and the phenomenal deposits of salt which characterize them have long been a source of this mineral in Louisiana. Within the next two years every geological formation of this character will be thoroughly searched for oil and gas, with the probability of finding very much more of both, especially gas. What this means to the State can be seen by the ease with which New Orleans and other cities can be supplied with natural gas for all fuel and lighting purposes; but to show what it means far beyond this, for the State's industrial development, we must consider the two other industrial minerals which occur in Louisiana as nowhere else in the United States—sulphur and salt.

The sulphur beds of Louisiana owe their development to the ingenuity of the oil-producer in drilling wells. The Frasch process of drilling to the sulphur and extracting it by hot water is not only known, but has made the Louisiana sulphur the dominant trade feature of the world in this industry. So much more sulphur is known in Louisiana than is being developed as to class the supply among the difficultly exhaustible mineral supplies of the United States. Salt can similarly be classed, and the exceptional variety of the salt must also be emphasized. It is, therefore, little short of inexplicable why these two minerals have not already led to the development of great chemical industries in Southern Louisiana, when backed up by such a fuel supply as, an abundance of natural gas and oil. It is not too much to say that there is no

known locality in the world where the natural resources are so combined as to make possible the production of sulphuric acid, soda, caustic soda and similar products at a lower cost than any place else on earth, and yet the sulphur and salt as produced, and the petroleum as well, have been exported from the State in the crudest possible form, with the least possible utilization of the easily available labor. Ten times the labor could be profitably employed; the population of the regions concerned could be greatly developed, and the wealth of all Southern Louisiana placed in a position comparable with the great chemical centers of Europe, and beyond any place which could be mentioned in the United States. The development of such industrial enterprise in the near future is a foregone conclusion.

Again, these same conditions make the Louisiana coast the ideal region for oil refining, in connection with the proposed pipe lines direct from the Oklahoma field. At the same time, the ease with which natural gas can be converted into electric power suggests the practicability of electro-chemical industries on a large scale, such as the production from the salt of hydrochloric acid and bleaching powder, the peroxides of sodium, magnesium, calcium, barium, etc., and the host of bleaching industries which follow, including the utilization of cotton at home. In connection with the oil refining it should be noted that a short haul across the Gulf of Mexico would supply fuller's earth from Florida for completing the refining of petroleum, and also the final purification of cottonseed oil. In connection with the refining of petroleum and the substitution of the Mid-Continent oils for those of the Gulf field, it should be remembered that, while most of the oils of the Gulf field are asphaltic and contain sulphur compounds sufficient to render refining difficult, all of the Louisiana oils are not of this character. It is interesting to note the sojourn of Captain Lucas in his old home in Southern Louisiana, where he is diligently studying out the future of the Louisiana oil industry, not only with the same patience and thoroughness characteristic of his work, but with that keen, unerring intuition which led him to success at Spindle Top. The outcome of his work will be looked forward to with great interest, and it should be noted that he has already found an oil much to the east of the other localities which is canary in color, absolutely clear, and not only contains no asphalt, but consists to a very large extent of vaseline and paraffine wax. Such an oil can hardly be equaled for refining purposes. Again, within the last few months these explorations to the east of the known fields have developed showings of natural gas which lead to the great probability of a sufficient supply for the entire region. The extension of oil and gas fields in the neighborhood of Morgan City will be looked forward to with very great interest.

Further, it must be understood that the oils of the Caddo region in Louisiana are also practically free from sulphur and well suited for refining purposes. The limits of this field are as yet by no means understood, and the probability is great for much oil from this region. Meanwhile, the natural-gas field there developed is probably the largest now known in the United States. Its quality leaves nothing to be desired. The one shame is the profligate criminal waste of this fuel into the air. Seventy million cubic feet of it, and perhaps more, are thus wasted, with the chance that many of the wells now being pumped for oil will "blow out" as gas wells. This condition is due to the antipathy of the oil man for natural gas and to his hope that by allowing this wonderful material to escape he may obtain more oil. In the case of the Caddo field this is an absolute fallacy, the oil and the gas strata being separated by hundreds of feet of rock. This is undoubtedly the most criminal waste ever known in natural gas in the United States. The light from these wells can be seen at night 25 miles away, at Shreveport. It is supposed to advertise the region. The plain fact that it tells is a willingness to debase the region of its greatest treasure—an attitude which must discourage the careful, saving, industrial man of other parts of the world from taking stock in the region. However, it also challenges the engineering skill for capping these wells and preserving this product for efficient utilization. Meanwhile the use already being made of it in Texarkana and Shreveport is developing manufacturing conditions many years in advance of the natural progress of industrial towns.

The close association of sulphur, petroleum, natural gas and salt, ready for the development of great chemical industries in Southern Louisiana, has been referred to many times in the public press, just as the association of iron ore, limestone and coal in the Birmingham district was the subject of much literature before it developed the manufacture of pig iron at record low cost. Doubtless the same will be true in Louisiana before chemical industries in that locality reach the commanding position in the world's industry to which geographic location entitles this region.

If you compare Southern Louisiana with such a great chemical center as Glasgow, Scotland, the geographic advantage of Louisiana is quickly seen. Imagine the same conditions existing in Glasgow, instead of the present necessity there of assembling their raw materials from distant quarters of the earth. Their chrome iron ore formerly came from Smyrna and now comes from the Island of New Caledonia, and their sulphur comes from Sicily or Louisiana. Pyrite they obtain from Spain. In fact, there is hardly any raw material for their manufactures which does not have to stand freight transportation for many hundred miles. Much the same condition prevails in Germany and France. The only difference in favor of these foreign countries is that the instinct toward chemical manufacturing has been bred in the people for generations, but against it we have only to apply in the United States the characteristic American adaptability to new enterprises, and it seems as though no obstacle were left to the realization of these important developments. A slight advance may possibly be made by reviewing the steps by which the industry may normally be expected to develop in Louisiana.

Sulphuric Acid.—By simply setting fire to the sulphur in appropriate kilns the fumes of sulphur dioxide are passed through the simple apparatus of the "contact" process, and without the necessity for large leaden chambers or Glover towers, etc., the sulphuric acid is quickly and cheaply produced and ready for the refining of petroleum products or the manufacture of commercial fertilizers from the phosphate rock, which can reach New Orleans by a short haul across the Gulf from Florida deposits. Further, it is quite easy to make sulphuric acid by this "contact" process in the form of "fuming," or "Nordhausen," sulphuric acid, which commands an unusually high price and is especially valuable in Southern Louisiana and Texas.

Bleaches.—At the same time, the natural gas, which has been found to the extent of 5,000,000 cubic feet per day in the Lirette well, not far from Morgan City, can be very easily applied in gas engines to the generation of large electric currents so cheaply as to make it practicable to apply these currents to electro-metallurgical

uses. First among these would be the manufacture of chlorine, bleaching powder, caustic soda and sodium peroxide from the wonderfully abundant and pure salt.

Soda.—Meantime this natural-gas fuel can be applied to the production of "salt cake," or sodium phosphate, from this salt by the use of the sulphuric acid mentioned above. The "salt cake" can then be transformed by the use of petroleum residues and the ever-essential natural gas into sodium carbonate. This "black-ash" process has been superseded to a large extent where fuel is high by the "ammonia-soda" process, but with the cheap fuel available even this long-known process could compete with the product of other regions.

Disinfectants.—With an unlimited and cheap supply of bleaching powder as obtained above, what possible terror could there be from a visitation of yellow fever in the future, when the most inferior grade which such a manufacturing plant would turn out as a waste product would be bountifully sufficient for all disinfectant purposes. There would be no need of exporting a pound of bleaching powder, even if the product were large, for the cotton mill in the South has come to stay, and one of its requirements is the bleaching of the product for which this material furnishes the necessary chlorine.

Soap.—Meanwhile the soda and caustic soda produced need not go out of the country, for they can, when combined with the most impure products of the cottonseed-oil mill, furnish the soap now generally imported, and the caustic soda would serve to refine the best grades of cottonseed oil. From the crude chemicals resulting from electro-chemical processes, with the cheap natural gas and the abundant sulphuric acid, obviously cheaper than anywhere else in the country, the number and variety of further chemical products would only be limited by the demand.

Aniline Dyes.—Meanwhile it should be borne in mind that the crude petroleum characteristic of the Gulf field in Texas and Louisiana contains, as the California material does, much crude material for the manufacture of aniline dyes. This is not true of the Pennsylvania oils, and here is a natural advantage for the Gulf product. Here again the sulphuric acid is essential, so is the hydrochloric acid easily obtainable by the action of the sulphuric acid on the salt. Other sulphur compounds, such as sodium sulphate and sodium dioxide gas before oxidation in the sulphuric acid, also enter as factors in these dyes, all of which will furnish the last step in converting raw cotton into colored prints before the cotton leaves the country where it is grown.

A Market for Chemical Education.—Against all this progress is the feeling of the Southern young man that the work is new and different from what he has learned by inheritance. In that lies the greatest strength of the movement, for here is the necessary incentive to more thorough education, and a market for all the educated brains that can be developed in the South for years to come. In proof of this study the course of the young man turned out as a chemist by any capable institution in the country. In the city where this paper is printed—Baltimore—any chemical graduate of Johns Hopkins University capable of doing research work is engaged months before the period of his education is completed—engaged for chemical industrial work where new problems continually presented give him the chance to continue his career as a student of practical chemical industries.

This is the true meaning which one must associate when traveling through the Caddo or other natural-gas regions of the South when he is startled by the roar from the escaping fuel or surprised by the unnatural glare on the sky at night, even 25 miles away, in Shreveport. This is the avenue of progress for which these mammoth torches blaze the way.

In considering the development of chemical industries in such an agricultural community as Southern Louisiana too much emphasis cannot be laid upon the necessity of the development of chemical industries if agriculture is to be placed on a permanent basis, independent of the richness of the soil, which is, of course, merely temporary richness, dependent upon the replacement of the chemicals which the crop extracts. This relation of chemical industry to successful agriculture has been most ably pointed out in an address before the Society of Chemical Industry by Prof. Adolf Frank, the pioneer in the development of the potash industry at Stassfurt. Professor Frank called attention to the fact that a vast number of analyses of the ashes of cultivated plants made by Liebig showed (1) the nourishment of all green plants consists of inorganic and mineral substances; (2) plants require carbonic acid, ammonia, nitric acid, water, phosphoric acid, sulphuric acid, silicic acid, lime, magnesia, potash, soda and iron; in addition, some also require common salt; (3) between all the component parts of the soil, water and air which participate in the life of the plant, between all parts of animals and plants, there is a connection in the sense that, if but one single link is missing in the chain of phenomena which brings about the conversion of inorganic matter into supporters of organic activity, the plant or the animal cannot thrive; (4) manures are useful only in so far as they contribute to the crop, the inorganic chemicals which the plants need. These principles of Liebig's developed modern fertilizers—first, the superphosphates, of which we produce more than any other nation in the world, but, unfortunately, export most of it before the phosphates have even been converted into superphosphates. Hayes, in his recent address before the Southern Commercial Congress, has made a strong plea for keeping these valuable phosphates at home and utilizing them here. It must be remembered that it is the South that controls the practical monopoly of these phosphate deposits.

The one chemical which should find its development in the South is potash. For the supply we must look to the feldspars of the Appalachian Mountain region. How this can be applied as a fertilizer has been developed recently by the wonderful work of Professor Cushman in the United States Department of Agriculture, but how long it will be before this source of supply is availed of by the Southern farmers is problematical, when one considers that in Germany, as pointed out by Professor Frank, the beet-sugar industry in the neighborhood of Magdeburg, Germany, took away about 5000 tons of potash from this district alone, and yet near by were the potash deposits of Stassfurt, where the potash was thrown away as absolute waste until Professor Frank, as a zealous disciple of Liebig, inaugurated the production of potash fertilizer, with the small output of five tons per day. This has developed to 5,000,000 tons a year at the present time. It is quite possible in this country to combine the treatment of our low-grade phosphate-rock deposits with ground feldspars and produce a basic phosphate, using carbonate of lime, which exists as an impurity, and develop a basic phosphate containing potash with both phosphoric acid and potash, valuable for plants. But far more important than either of these is the development in the South, by means of additional activity in chemical industries, of a suitable supply of nitrogen. First, this should, of course, come from the complete utilization of all of the ammonia from the manufacture of coke, but still more effective will be the utilization of what is now

waste water-power for the development of cheap electricity along the eastern slope of the Appalachian Mountains, and with this electricity to utilize the nitrogen of the atmosphere, according to both of the processes recently successfully developed for that purpose. As already pointed out, it is possible also to substitute cheap natural-gas fuel in the place of water-powers in the flat Gulf Coast region for electro-chemical processes of this kind. To explain these two processes simply it is only necessary to know that when air is passed across the space of an electric arc some of the nitrogen combines with the oxygen of the air to form nitric fumes by the addition of water, but still more readily made into available form as a fertilizer by simply passing these gases through milk of lime and developing calcium nitrate, a material better than sodium nitrate for fertilizing purposes.

Again, it was found long ago that such nitrogen compounds as cyanogen and ammonia are formed when nitrogen is passed over highly heated mixtures of coal and alkalis. The attempts made to utilize these by the Atmospheric Products Co., at Niagara Falls, years ago have now been developed into the processes of Birkeland & Eyde and others, with the production of merchantable fertilizers. In 1894 the discovery by a Southerner, Wilson, of calcium carbide as a product of the electrical furnace led the way for a new method of converting the nitrogen of the atmosphere into fertilizers. In the following year, 1895, it was found that when atmospheric nitrogen passed over such carbides the nitrogen was absorbed, and by an easy series of reactions the nitrogen could finally be turned out as ammonium carbonate, the most valuable nitrogen fertilizer possible. The details of the development of these nitrogen fertilizers is one of the most fascinating chemical studies of modern times. The experimental work has been contributed to by chemists in England, Germany, France, Sweden, Norway, Italy and even Japan, but, after all, it was the characteristically cheap electric-power furnished by water along the "fall line" of the Atlantic Slope which started this entire investigation and ultimately led to its success; and it is only just that this great discovery should return to the infinite benefit of the Southern States in furnishing a cheap supply of nitrogen fertilizers. This means not only greatly increased cotton crops, but it means extending the cotton belt farther north, with success and safety, in proportion as such nitrogenous fertilizers are used. By the development of such a chemical industry, and the development of such fertilizers, we cannot only prevent soils from becoming barren, but exhausted soils can be brought again into full fertility, and the practice of allowing the lands to lie fallow (which simply means giving to the soil the amount of time necessary for the plant juices to render soluble the necessary insoluble ingredients of plant life) can be entirely avoided, and any crop can be made successful any year. As usual, it is not only one feature of industrial activity which is needed, but it is the co-operation of agriculturists with intelligent promoters of chemical industries, first for the benefit of the agricultural products of the South, and then for the many manufacturing enterprises which will follow, and with the aid of sound engineering education for the students of our Southern colleges.

Secretary James Wilson and Southern Farming.

By ROBERT M. REESE.

[Written for the Manufacturers' Record.]

On March 4 next James Wilson will have served 12 years as a Cabinet officer. Born in Scotland, Mr. Wilson has spent 56 years of his life in the United States, and of them, 38 years have been devoted directly to the promotion of agricultural interests. Nearly one-sixth of his life has been occupied in the performance of the manifold and ever-increasing duties of Secretary of Agriculture.

"The business of agriculture has made wonderful progress throughout the whole United States in the last 10 or 12 years," said Secretary Wilson of the National Department of Agriculture in an interview for the MANUFACTURERS' RECORD. "In this advance the South has richly shared. The turning point of better prices for farm products came about 1897, and since that time the financial condition of the farmer has steadily improved. The production of cotton increased 53 per cent. from 1896 to 1908, and the value of the crop 133 per cent. An immense load of mortgage indebtedness has been lifted from Southern plantations by this great advance in the value of cotton, and I see no reasons why the old conditions should ever return. The South has her feet solidly planted on an improved and improving agriculture, is sensible of past mistakes and is greedily absorbing the new knowledge that science has placed before her. I believe that the greatest prosperity in agriculture comes when large crops are sold at moderate prices, so that there is neither loss from absolute scarcity in a short-crop year nor from abnormally low prices, such as prevail in a time of overproduction. The South can raise vastly more cotton than she does now without bringing into cultivation another acre of the available cotton lands, and thus, by reducing the cost to the farmer make it possible to sell profitably at moderate prices. As a matter of fact, the large crop of this year will, in all probability, equal in value the highest record, although the farm price of cotton is more than a cent a pound less than last year. The production of corn in the South not only can be increased, but is actually increasing. The eradication of the cattle tick and the extension of forage crops will establish the animal industry on a better basis, and this will add largely to the wealth of the South. The increasing diversification of crops will more and more tend to increase the farmer's cash returns, while making his living more comfortable. Very great benefit is to be expected from the wider use of leguminous plants, those wonderful gatherers of nitrogen from the air, which serve the double purpose of furnishing excellent forage, while enriching the soil. The natural advantages of the South for a profitable agriculture are becoming better appreciated every day. Immigration into that section is certain to increase as its advantages become better understood. There will be more farms and closer cultivation, improvement in yield and quality of product, and larger deposits in the banks. Upon a better financial basis the South will build a great and progressive civilization, strengthening her educational systems, improving the conditions of health and taking the place she merits in the estimation of the world.

"I do not belittle the part that will be played in the future greatness of the South by its manufactures, its commerce or its transportation systems, but in the South, as in the whole nation, the foundation of prosperity is an enlightened agriculture. The South, through her monopoly of cotton production, has always contributed heavily to the national wealth, and as time goes on she will pour into the channels of commerce wealth from a multitude of other agricultural sources that will swell the stream to a

mighty river. More and more will capital seek investment in the South as its advantages are made known to the world. The work which the MANUFACTURERS' RECORD has for years been doing has been fruitful in good to the South, and deserves the widest recognition. I am happy to have an opportunity to express in its columns the Department of Agriculture's good-will toward the South and its desire to foster in every way the agricultural prosperity of that great and favored region.

"The trucking industry of the South is making a wonderful growth. That this growth is not measured by accurate statistical reports is regrettable, but from the nature of the business, considering the variety of crops included in trucking and the scattered location of truck farms, it has been found impossible to make quantitative estimates of production in this field. However, it is safe to say that the measure of the industry today is by the thousand of carloads or by shiploads of 25,000 packages. This enormous business is the growth of less than 25 years. Northern markets began to be supplied with truck products from Norfolk by rail in 1885, and from Charleston in 1888. What the business will grow to no man can forecast, but the present-day demand for fresh vegetables the year round in great city markets would seem to insure a steady and increasing consumption of truck products. The Atlantic and Gulf coast regions have a peculiar and very valuable advantage for this industry in their mild climate, which allows the growing as field crops of certain products which farther north require some protection, and still farther north must be grown under glass. Lettuce, for example, is raised as a field crop in Florida. Moving up the coast to Charleston and Wilmington, it becomes a frame crop, while near New York and Boston it is chiefly a product of forcing houses.

"The trucking industry, as a great commercial enterprise, depends largely upon certain products which are now almost staple. Lettuce, radishes, peas, beans, potatoes, cabbage, summer squash and beets are grown in nearly every trucking district along the whole Atlantic coast, from Florida northward. These are vegetables which are in continuous demand in the markets, and their production moves up the coast, as the season advances, like a great green wave. The business is peculiarly dependent upon transportation for its success, and here, too, the South enjoys special advantages in having, from some at least of the great trucking centers, transportation by both rail and water to the great Northern markets. I am not familiar with the trucking industry along the Gulf coast, but glowing reports of profitable enterprises in that region have come to us, and our field men say that in many places there exist soils admirably fitted for this form of agriculture.

"A word might be said of the citrus fruit industry in Florida, which produces some of the finest-flavored oranges that come to market. The King orange, for example (though somewhat variable) is of very high quality, and well worth the attention of growers for a special market which will pay for quality. The department hopes to be of service to Florida orange growers in disseminating information as to better methods in picking and handling the fruit for shipment. From 1 to 35 per cent. of the fruit is found to be injured in picking, and our pomologists assert that this heavy loss can be reduced to an average of not more than 1 per cent. by efficient supervision of labor. The losses on Florida oranges due to careless picking and decay in transit are estimated to reach \$500,000 a year, most of which, it is believed, can be saved by greater care in handling to prevent mechanical injury.

"But, after all, if the diversification of Southern agriculture has not arrived, it is arriving. A region whose products include cotton, corn, rice, sugar and tobacco as staple crops; which has a wonderfully rich and varied production of such truck crops as celery, lettuce, cabbages, onions, spinach, strawberries, cantaloupes, watermelons, and so forth; which has a great orange region, a great peach region and a great apple region, is assuredly enjoying many of the benefits of a diversified agriculture. I would like to see more farm animals kept in the South, and I expect to see them, for, with the eradication of the cattle tick, of which I shall speak later, one of the principal obstacles to animal husbandry in the South will be removed. Nothing will more surely help diversification than the keeping of more and better animals. They compel the farmer to raise corn and forage for their keep, and they reward him richly for his labors by supplying much-needed manure.

"The work of our Soil Survey, under Dr. Milton Whitney, has been of much help in furthering diversification. The aim of this work is to ascertain and map the various types of soils that are found in a given area, and every one of the Southern States has had extensive surveys made in it. In fact, the largest area we have yet surveyed is in Texas, where over 8,000,000 acres have been surveyed, while the next largest is in Alabama, and in each of the States of Virginia, North and South Carolina, Mississippi, Louisiana and Tennessee over 3,000,000 acres have been surveyed. In some of these States assistance has been given by the State authorities working in co-operation with our men. In all the Southern States this work has disclosed a wide variety of soil types, and correspondingly wide possibilities of diversification are indicated. In Louisiana a soil survey across the northern part of the State is asked for by the State authorities in order that the soils of that region, now being stripped of its timber, may be differentiated and mapped. A variety of agricultural products are suited to that part of the State, and they may be introduced when the proper soils are known to be available. In Southern Mississippi surveys already made have shown that the greater part of the soils of that part of the State are well adapted to trucking, to cotton-raising and to certain forage crops. In Northern Mississippi, where practically the last low-priced prairie soils left in the United States are found, the soil surveys have shown the existence of large bodies of land peculiarly well fitted for the production of alfalfa. It would be easy, in fact, to show from the results of the soil survey work that in every Southern State a great variety of soils, suited to a variety of crops, is found, and our plant men, following the surveyors, will recommend the proper crop for each type of soil. The cost of the soil survey is about half a cent per acre, and the results are well worth many times the trifling expenditure.

"I am reminded here of the many requests that come to us, from persons intending to settle in one or another of the Southern States, for information regarding the soil, climate and agricultural possibilities of the section they have in mind. Although the whole region is not yet surveyed and mapped, enough has been done to make it possible in almost every case to give valuable information to the inquirers. Their number indicates that there must be a great many people thinking of locating in the South. When I am asked, as sometimes happens, by correspondents who have no special place in mind, where they should seek to buy land, I remind them that the cheapest lands are now in the South, and that these lands, as a general thing, need nothing but skillful handling to pay well. The farm lands of the middle West are now so high in price (I

know of some that are held at \$75 to \$100 per acre) that considerable capital is required for a new venture in farming them, whereas the South offers abundant room for industrious settlers on lands that are cheap in price, capable of high productivity, and enjoy a long growing season. Nor, in my opinion, need the Western or Northern farmer hesitate to take up Southern land for fear of loss through ignorance of Southern conditions and methods. Often he can follow much the same line of farming he has been used to, modified as any intelligent man would modify it, and when he cannot, there are many other opportunities for a profitable agriculture as to which he can easily obtain safe guidance through his initial difficulties.

"I have always taken a great interest in the agriculture of the South, not only because of its extremely interesting possibilities, but because I have felt a keen sympathy with a people struggling bravely to overcome the results of a devastating war. I felt that they needed such help as the department could give them, and I have lent a willing ear to their appeals. Even before the appearance of the boll-weevil in Texas we were doing a good deal of work in Southern fields, but the alarm caused by the appearance of that unwelcome immigrant from Mexico started us on a line of work that has developed into a movement which, I believe, will help to reanimate the whole spirit of Southern agriculture. I am speaking now of the farmers' co-operative demonstration work, conducted by the Bureau of Plant Industry, under the direction of Dr. S. A. Knapp.

"This work was begun primarily to show farmers how they could raise cotton in spite of the weevil. In this it was eminently successful, our agents proving by actual field demonstrations that by using early-maturing seed, destroying the stalks in the fall, and by better cultivation, good crops of cotton could be raised in sections where the weevil was abundant. To this result the Bureau of Entomology, under the direction of Dr. L. O. Howard, by its studies of the life-history of the insect and other lines of work, contributed largely. But as the work went on it became clear that another important field lay ready for cultivation, and Dr. Knapp's people entered upon it with enthusiasm.

"This field was the diversification of Southern agriculture. For years writers upon Southern agriculture have commented upon the economic unwisdom of its one-crop system, sometimes implying, if not explicitly stating, that this was characteristic of the South alone. And this was quite unfair, because the same thing has happened in other parts of the United States, notably in some of the wheat-growing regions, where the raising of wheat year after year upon the same soil has brought about exactly the same condition of soil exhaustion that was observed in the cotton-raising South. In the campaign against the boll-weevil the benefits of diversification were always earnestly advocated by Dr. Knapp and his agents, to the end that the planter, especially the little fellow, might raise the home supplies as far as possible and have the cotton for a cash crop. Whenever this is done, a long step has been taken away from the pernicious credit system upon which so much farming is done in the South, and further progress toward better living becomes possible.

"Dr. Knapp's work deals principally with the smaller and industrially feeble farmers. In the Bureau of Plant Industry, under the direction of Prof. W. J. Spillman, the farm management investigations have to do more with the farmer who has lifted himself somewhat above the average. Here the aim is to encourage better systems of farm management, looking to the restoration of fertility, the bringing back of humus into the soil, the suggestion of improved rotations, and, broadly, the investigation and teaching of all subjects comprehended under good farm management. It tries to help the good farmer to become a better farmer, and to lift the man who is in a rut out of the old ways into something better.

"Both Dr. Knapp's and Professor Spillman's efforts, under the guidance of Dr. B. T. Galloway, the chief of the bureau, have achieved practical results in the shape of better cash returns that are of great value as object-lessons. When a struggling farmer, living, as is too often the case, in a small and comfortless frame shack, is first helped to get out of debt and then to save a little money by his own efforts, he is put in a position to take further steps toward happy and satisfied living. And he takes them. Many reports came to us of farmers who, helped to get better returns from their labor, immediately begin to improve their homes. Yards and premises are cleaned up, fences repaired, whitewash applied, and the whole place takes on a more prosperous appearance. The family lives better, the farm implements are improved, and the live-stock graded up. These are tangible results that anybody can see. But there is another result, tangible, but even more valuable. The man is awakened. He sees the possibility of better conditions for himself and his family, and he sees the way to realize that possibility. Let no one suppose that the small Southern farmer prefers to live in the limited way that has so long been his condition. Give him the knowledge and the means to improve his environment, and he will do it fast enough. He has lacked nothing but the instruction needed to show the better way, and a better financial basis from which to work. Given these, he seeks higher levels of living immediately. This work is, indeed, a real uplift for thousands of discouraged men. As Dr. Knapp said of one of them who followed the advice of a demonstration agent, 'He made a good crop, but the man grew faster than the crop.'

"The Bureau of Plant Industry is carrying on many other lines of work in and for the South. It has devoted particular attention to cotton, aiming at the improvement of strains by breeding and selection, and has studied especially the condition and needs of the Sea Island cotton industry along the coast from South Carolina to Florida. The work with cotton has progressed to a point where the department is distributing, or is ready to distribute, some quite valuable new types of cotton, including a long-staple variety for the uplands and a disease-resistant strain for regions where 'wilt' and other diseases are prevalent. Important and successful work on the improvement of tobaccos has been done in Alabama, Florida, Texas, Kentucky and Tennessee. A number of special industries of less importance have also been studied and more or less developed, such as the growing of drug plants in South Carolina, the matting-rush industry (based on a rush imported from Japan), the growing on a commercial scale of camphor in Florida and Texas, and quite recently paprika peppers have been shown to be a profitable crop in a small way. These minor matters are, I think, worth passing mention, because they aid diversification and show something of the wide range of possibilities in the Southern field.

"The act making appropriations for the department for the current fiscal year carries \$250,000 for continuing, in co-operation with the States, the work of eradicating

the cattle tick. The Bureau of Animal Industry, under Dr. A. D. Melvin, is actively prosecuting this work, which aims at nothing less than the complete removal from Southern agriculture of one of its heaviest handicaps. During the last fiscal year more than 40,000 square miles were released from quarantine, and since the beginning of operations, some three years ago, nearly 64,000 square miles have been rid of this troublesome and costly pest. The heavy black line of the quarantine against Southern cattle is being steadily driven southward, and the day will come when Southern cattle may move in commerce as freely as those of any other section, while the quality and health of the animals themselves will be greatly improved. The Bureau of Entomology, by its admirable studies into the life-history of the fever tick, has also done notable service in this campaign.

"Closely related to the animal husbandry of the South is the problem of finding new forage plants. Here the Bureau of Plant Industry is at work, looking especially for leguminous plants, which, while furnishing excellent forage for cattle, will also help to improve the soil, whether plowed in to restore humus or through their nitrogen-gathering powers. Among these plants a new velvet bean from the Philippines is very promising. In most of the Southern States experiments have been conducted with a view to establishing the conditions of success with legumes, and it seems that the cases of failures reported are mostly due to the lack of inoculation of the soil. But when once the land is thoroughly inoculated, there is little difficulty in securing a good stand of vetches or crimson clover sown with the cotton in summer.

"The Dairy Division, at my special direction, has devoted much attention to a study of dairy conditions in the South, and nine dairy experts give practically their whole time to this field. Better methods in the production of milk, and better methods in marketing it, are the particular objects aimed at. Very satisfactory results have been reached, and several of the States are taking up the work for themselves. As it progresses the department may very properly withdraw and allow the States to continue along their own lines.

"These co-ordinated activities look to the improvement of the animal husbandry of the South in all its branches. Every natural advantage for a great and prosperous industry based upon cattle is found in the South, and with the eradication of the dreaded fever tick, which is certain to come in time, these natural advantages will be developed to the full. Two incidental results which will follow are these: The fertilizer bill will be reduced, first, because leguminous forage crops will put nitrogen from the air into the soil, and next because more manure is available the more farm animals are kept. The Commissioner of Agriculture of South Carolina, for example, has recently set the fertilizer bill of his State (not one of the largest in the South) at over \$15,000,000. A great reduction of this heavy burden would be made by keeping more farm animals and husbanding their manure. Secondly, the supply of food for the home table will be improved and cheapened. Milk, used on the table or fed to swine and poultry, is worth a good deal in the effort to supply the home table from the farm.

"I have been pleased to notice among Southern people an awakening interest in good roads, an interest of which the Southeastern Road Congress, held at Atlanta, Ga., is a proof. The director of the office of public roads, Mr. L. W. Page, attended this congress on the part of the department, and he reports to me that the gathering was enthusiastic and determined in its plans for improving the roads of the South. In this work the South has been handicapped by the lack in many places of hard materials for road building. The office of public roads has given much study to Southern conditions, and since 1892 has built short experimental sections of road—macadam, gravel, earth, shell, tar, sand-clay, burnt-clay and oiled—to the number of 91 in Southern States. The sand-clay method has proven satisfactory in many places, and has been introduced wherever practicable. For example, Pike county, Alabama, which had determined to issue bonds for \$100,000 for macadam roads, upon the advice of an engineer from the office of public roads, substituted the sand-clay method, with the result that Pike county now has a splendid system of sand-clay roads at a cost of less than one-third the cost of macadam. In the Mississippi Delta the burnt-clay road has been successfully tried, and actual road tests show that very satisfactory roads can be made of burnt clay or 'gumbo' at a cost of one-third to one-half that of macadam.

"The work of the whole department is done as much for the South as for any other part of the United States, and the South shares in whatever benefits accrue from the operations of all our bureaus. The frost, flood and storm warnings of the Weather Bureau, the extended investigations of the Forest Service, the work of the drainage engineers in connection with swamp lands, and the investigations of the Biological Survey into the depredations of injurious birds and mammals serve the interests of the South as faithfully as of any other part of the country.

"In conclusion, it is very gratifying to see the cordial spirit of appreciation manifested by the people of the South for the work the department is trying to do. Members of Congress, commissioners of agriculture, the heads of agricultural colleges and experiment stations, railroad men, the press and hundreds of private persons have expressed themselves warmly on this subject. To try to serve a people so appreciative of what we may be able to do for them is a pleasure to all of us who are engaged in this work."

Potentiality of Water-Power Resources of the South.

By H. VON SCHON.

[Written for the Manufacturers' Record.]

Mr. H. von Schon of Detroit, Mich., is eminent not only as a writer upon water-power development for electric purposes, but also as a consulting hydro-electric engineer of wide experience. He is a member of the American Society of Civil Engineers and of the Western Society of Engineers. Mr. von Schon received his technical training in Germany, and has had 25 years of engineering practice in this country. He has designed many power plants, chief among them the 50,000-horse-power development at the outlet of Lake Superior, and he is not a stranger to the South, where he has an extensive practice. A work by him recently published through J. B. Lippincott Company, Philadelphia, entitled "Hydro-Electric Practice," was written specifically for non-professional interests in water-power development and utilization.

Gold made the Pacific Coast famous; the Lake States supply the world with timber and iron; the great West with wheat, and the South with cotton; but where are these staples shaped into the thousand and one different products demanded by mankind;

where are they manufactured into the useful articles; what employs those great nations of Europe who have no surplus staples to distribute abroad?

The industrial development of a country is not perfected by exploiting and disposing of the products of its soil and mines, but by the most economical and resourceful utilization of all that the land and the earth and the water will yield for the purpose of supplying the most useful products thereof to its own and to the peoples of other sections.

California has not gained its present industrial development alone by the mining of the precious metal, Michigan and Wisconsin by the cutting down of their forests, and Minnesota by the mining and exporting of its iron ore; nor will the South's industrial pinnacle be reached by raising the world's cotton crop and continuing to distribute the staple. Agriculture and manufacturing are, and always will be, the two leading industrial activities; to sustain life of man and beast, to feed and clothe is the prime, and to furnish the necessities for the healthful and contented existence of humanity is an equally important essential. The people who can provide these for themselves to the greatest extent out of their own country's resources and also supply them in large quantities to other sections are industrial leaders, and correspondingly the garnerers of rich and well-merited rewards.

Agriculture is the first; its extent, value and importance of relation to the industrial development of a section depends largely upon basic conditions which are beyond the ordering of man; a fruitful soil, plentiful and well-distributed rainfall, a long warm and correspondingly short frozen season are required to raise the products of agriculture of a section beyond and above the function of supplying the wants of its own people. In this respect the South is certainly "of the blessed," as no more perfect tout ensemble could be ordered than that arranged by Nature to guarantee the availability of a most diversified and bountiful yield of the soil in the sunny South.

And the Southern people are fully alive to this opportunity; the population aggregates some 27,000,000, the area 850,000 square miles; 530,000 square miles are agricultural land, of which 200,000 are improved. The value of the farm products this year will reach \$225,000,000, while that of the United States is placed at \$8,000,000,-



HYDRO-ELECTRIC DAM IN THE PATAPSCO RIVER, MARYLAND, CONTAINING THE MACHINERY FOR WATER-POWER DEVELOPMENT.

000. The South is certainly giving an excellent account of its stewardship of these bountiful agricultural resources, producing more than one-fourth of those of the entire country.

But what about the manufactures, the second of importance in industrial development? The proximity of raw materials, transportation means and methods, operating personnel and economical power form the group of essentials to make manufactures a feasible success. And again it may be stated that they are found more perfectly combined in the South as a section than in any other of the United States. The record of the South's manufacturing progress shows great activity in this direction, the aggregate value of its products having advanced from \$500,000,000 in 1880 to \$2,500,000,000 in 1908; this is about one-eighth of the output of the United States, while the population is nearly one-third; and, if the basic conditions favor manufactures, the above proportions of products may soon be brought more nearly to those of agriculture.

The principal raw materials of the South are cotton, iron ore, timber and fuels. The 1907 yield of these was, in round figures: 12,000,000 bales (6,000,000,000 pounds) of cotton, 6,000,000 tons of cottonseed, 6,000,000 tons of iron ore, 20,000,000,000 feet of lumber and 95,000,000 tons of coal. Of these were manufactured during the same period 1,000,000,000 pounds of cotton (one-sixth of the total), 4,000,000 tons of cottonseed (two-thirds of the total), 4,000,000 tons of pig-iron (two-thirds of the total) and 9,000,000 tons of coke.

This certainly substantiates the fact that the manufactures of the South now equal in volume and importance those of any similar geographical section, but it also discloses the great possibilities of future expansion in this development.

The cotton industries, for instance, of the South now represent one-third of the total in the United States; in 1900 it was one-fifth; in 1880, one-sixteenth; the bulk of the remaining two-thirds is now monopolized by New England, and Massachusetts practically equals the entire South in this item.

The transportation facilities of the South not only equal, but surpass those of any other section. There are 31 deep-water outlets along its coast; its present railroad mileage aggregates 67,000 miles (more than one-fourth of that in the United States), while the navigable waterways represent a mileage exceeding 16,000.

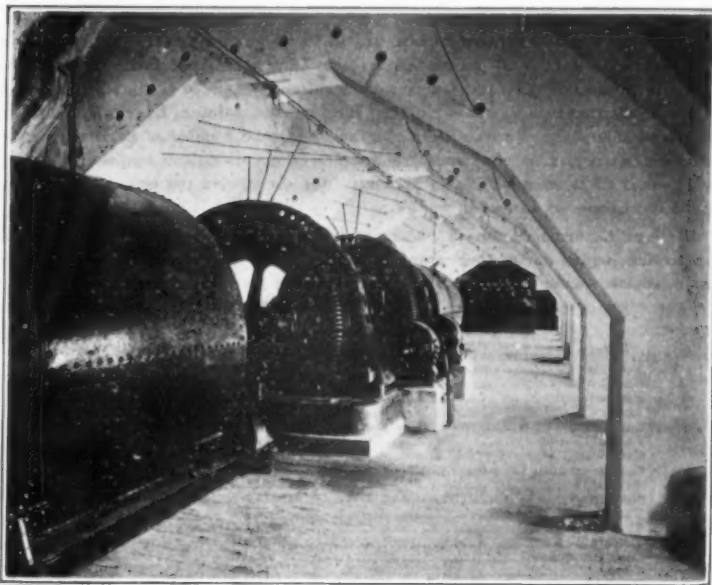
The factor of industrial labor as bearing upon the future expansion of the industrial development of the South presents nothing that should retard it; of the total population of 27,000,000 one-third is colored, most of which finds employment in agriculture.

The South can offer every inducement by which skilled operatives are attracted, principally its magnificent climate, and there need be no apprehension of the scarcity of industrial labor to meet the greatest possible expansion of the South's industrial development.

And this brings us to the last, but not the least, of the fundamentals upon which the manufacturing development of a section depends, and that is *power*. This is an essential factor in all manufacturing; in many cases it represents an important part of the cost of the product, and in some respects influences the quality of the output. The power used in the industries of the United States in 1905 was 15,000,000 horsepower, 16 per cent. of this in the South, and 1,040,000 represented the cotton mills.

Of all the evolutions in methods of manufacturing, none has worked greater betterments and economies than the application of power. The mechanical drive is rapidly disappearing from mills and shops being supplanted by individual electric motors; the unsightly and wasteful line shafts, pulleys and belts have seen their best days, and so has the factory power plant, generally speaking. Electric current served from central power stations, applied by separate motors for each machine or group of such, is the modern arrangement; this represents enhanced efficiency of power service, abolishes the noise and dirt of shaft and belt runs, secures greater and more uniform machine speed and guarantees to the mill operator the privilege of paying only for actual working power. Economical electric power will contribute more toward the industrial development of a section than any of the other fundamental essentials heretofore named.

The chief sources of power are in fuel and water, and under normal conditions the latter is by far the more economical. Water-power should need no definition or explanation before an audience of Southern readers, because there is no section in the United States where Nature has provided a greater store of this beneficial and valuable resource. Flow and fall are the factors; the first depends upon precipitation, which throughout the South exceeds that of the other sections in this country, with the exception of a small area on the Pacific Coast, by from 20 to 100 per cent. There is no scarcity of water in the Southern rivers, or at least there need be none if a reasonable



INTERIOR VIEW OF HYDRO-ELECTRIC DAM IN THE PATAPSCO RIVER, MARYLAND, SHOWING POWER MACHINERY.

policy of conservation were pursued. The fall of Southern rivers is also plentiful, as they find their source largely in the Appalachian ranges.

What, then, is the explanation of the fact that of some 5,000,000 horse-power of available water-power in the South, only about one-tenth is yet harnessed? Has the South missed the lessons taught by Switzerland, France, Germany and Sweden? Have the Southern people not heard of our own Niagara or seen the miles of factories grouped along its shore; of Holyoke, Worcester, Springfield, Bangor, Massena, Mechanicsville, the Sault, Duluth, Minneapolis, Taylors Falls, Helena and hundreds of other hydro-electric developments of the last decade? Yes, they have, and know as much about the subject, and perhaps more, than is the case in other sections; but it has come with such a rush, this modern water-power utility, this hydro-electric agency, and the people as a whole have not caught up with it. The financial man is not prepared to advise his client investors as to what sort of investment and security these hydro-electric bonds are; what of their earning capacity, depreciation of plants, security or insurance against destruction; all these are generally unknown factors—unknown to the very large majority of that class of men who energize other industrial enterprises with their support and their money. Everybody has heard of washed-out dams; one such calamity as the one of the Austin (Texas) dam remains a live topic for years; ships and railroad trains are wrecked, unfortunately, quite often, still we are not in the least deterred from boarding them or putting our investments in railroad and steamship securities; but water-power projects do not find ready support, the investing public lacks that first essential—confidence—in the general glowing representations of the proposed opportunity. In short, the people as a whole do not know enough about the character of a hydro-electric plant, its possibilities and permanency, to be capable of any longing desire to share in the promised harvest of its surplus earning capacity.

The altogether desirable development and putting to useful work of every now wasting water-power in the South, and for that matter in this whole land, is retarded by a combination of unfortunate conditions, none of which has any right to exist. There is the unbusinesslike, slipshod fashion in which these important propositions are generally first exploited. Any young lawyer will choose a water-power project for his golden theme; he knows nothing of the business, and, of course, does not expect to put his money into proper investigations. What wonder that he not only fails to get a hearing, but adds to the general distrust against the whole line. Then there is the dilettant hydraulic engineer; never built a plant, but ready to pronounce his Solomonian

dictum for any consideration. If the project is, unfortunately, launched and steered according to such a chart, what wonder that it goes on the rocks and leaves the distressed passengers high and dry! These are not fanciful pictures; they are absolute facts. Water-power projects, like mining, transportation and large manufacturing enterprises, are important industrial undertakings; they generally run into hundreds of thousands; they should always be analyzed, especially in the initial stages, by an absolutely qualified expert specialist, so that no false water-mark can be impressed upon them; the surveys may be made by any competent engineer, but the conclusions of feasibility, output, constancy, cost and market—these should come from the unimpeachable authority. His findings, if erroneous in any particular, will be on the side of safety, of conservatism as regards the prospective investors' interests; on such the trust company's president, the great financial adviser, can act with the same degree of assurance as he can upon the known market value of current industrial securities.

A hydro-electric project's output capacity and its cost can, in all but a few exceptional cases, be determined with the accuracy of the estimate of any other industrial plant; the market opportunity for the product can be likewise clearly analyzed, and then the financial result is readily deduced. If the cost of delivering the electric output of a hydro-electric plant at the available market point is within \$175 per kilowatt, it can successfully compete with the most economical steam-power current and earn a handsome surplus; the depreciation of properly designed and constructed works is nil; of the equipment, not more than half of a refined steam plant; the maintenance charges are a small per cent. of any other power-generating installation, and those for operation likewise. A 1000-horse-power steam plant burns 50 tons of coal a day, a hydro-electric plant none; fuel and ash handling, water supply, boiler and engine repairs are all abolished in the hydro-electric; the life of its work is 10 to 1 of the steam, and its destruction no more probable than that of a properly constructed bridge, tunnel or skyscraper.

There is still another condition which, at present at least, retards water-power development, namely, the tardiness of the Federal and State Governments to put into execution a sane policy of conserving the flood flow of our rivers—of the rivers of the South.

Fest or famine well characterize their present flow conditions, floods and drouths. The summer just passed has added to the history of both.

Yet, in the face of all these drawbacks, the South can point to several successful hydro-electric developments—successful in the building up of manufacturing industries as good investments. Augusta, Ga., has set a splendid example as the electric city of the South; Chattanooga will soon rival it. Birmingham, Atlanta, Knoxville, Nashville, Macon and Memphis are within sight of it, and the great number of cities and thrifty towns which are yet to experience the benefits of plentiful and economical electric energy could all be supplied if this so bountifully distributed power source were harnessed and harnessed instead of wasted.

A recent Government report on the water-power resources of the rivers of the Appalachian region quotes their power capacities under the present uncontrolled, and with a feasible regulation of flow and conservation of flood waters, as follows:

River.	Power capacity in horse-power, with natural flow.	Power capacity in horse-power, with conserved flow.
Potomac.....	54,000	153,000
Shenandoah.....	10,000	26,000
Rappahannock.....	12,000	30,000
James.....	86,000	262,000
Roanoke.....	99,000	174,000
Fedee (Yadkin).....	106,000	263,000
Catawba.....	89,000	135,000
Congaree and Broad.....	79,000	141,000
Saluda.....	43,000	92,000
Savannah.....	83,000	203,000
Tugaloo.....	13,000	40,000
Chattanooga.....	19,000	30,000
Tallulah.....	21,000	33,000
Chattahoochee.....	106,000	195,000
Coosa.....	93,000	190,000
Etowah.....	24,000	60,000
Monongahela.....	6,000	40,000
Tygart's Valley.....	14,000	78,000
Cheat.....	11,000	50,000
Buckhanna.....	3,000	13,000
Youghiogheny.....	13,000	74,000
Great Kanawha.....	170,000	529,000
New.....	8,000	15,000
Greenbrier.....	8,000	63,000
Gauley.....	38,000	85,000
Elk.....	12,000	27,000
Hawassa.....	54,000	95,000
Toxoca.....	41,000	58,000
Clinch.....	30,000	84,000
Powell.....	12,000	19,000
Little Tennessee.....	100,000	167,000
Tellico.....	7,000	11,000
Citico Creek.....	2,000	.....
Abrams Creek.....	3,000	.....
Cheablar.....	7,000	.....
Tuskegee.....	9,000	15,000
French Broad and tributaries.....	143,000	.....
Little Pigeon.....	8,000	.....
Bellchucky.....	54,000	81,000
Pigeon.....	32,000	.....
Holston and tributaries.....	60,000	.....
Watauga and tributaries.....	29,000	.....
Kentucky.....	8,000	38,000
Green.....	12,000	35,000
Cumberland.....	80,000	430,000
Tennessee.....	973,000	1,589,000
Black Warrior.....	18,000	52,000

Nearly 3,000,000 horse-power available with the natural flow, and 5,500,000 if a portion of the flood waters were conserved, and this list is far from being complete; the rivers in Missouri, Mississippi, Arkansas, Louisiana, Florida, Oklahoma and Texas are not enumerated, and many tributaries of the main rivers have not been incorporated.

This is a startling showing; it should set people thinking and talking about conservation of water-power resources—the people of the South, the owners of this splendid heritage. What is the money value of the destruction wrought annually by floods, it runs into hundreds of millions; what is the loss represented by the present wasting of these possible power sources; would these not go a long way toward carrying into effect a reasonable flood-flow conservation program, establishing the storage reservoirs, building the dams and operating them? Investigations show that they would, and that a light tax on the water-powers thus made available would pay the interest on all such works; that the effect would not only be to diminish the floods and their consequent destruction, to reduce the erosion of land and sedimentation of streams, but also to supply a sufficient flow to render all-year navigation a certainty.

This is not a dream born of a fanciful mind; it is a realistic possibility, and, more

than that, it would pay a larger return on the investment than any of our great national undertakings for the public weal can lay claim to.

What has and is being done in India, in Egypt, can be done in the United States in the South, and it should be started at once, for the day is at hand when we must take stock of our resources and bethink ourselves how to best husband them.

The State of Wisconsin has within the recent past enacted a statute conferring upon water-power enterprises the privilege of eminent domain for the purpose of conserving the surplus of flood-flow of rivers in storage reservoirs, and has vested in such corporations the right to collect a toll from all owners of powers on such streams. Such a policy, surrounded with proper safeguards, will bring about the conservation of the greatest resourceful power output of every stream where reservoirs are available and will cause the speedy development and utilization of such powers, and thus place at the disposal of the people plenty and cheap energy.

The State of New York has a water-supply commission, which receives the request of communities that desire a supply of electric energy, or of corporations which wish to develop a water-power opportunity; it is equipped with organization and funds to investigate either case by making surveys for reservoir sites and report its findings to the Legislature. If the project is endorsed by the commission, the Legislature authorizes the issue of securities with the State's guarantee, sets aside forest and water reserves and supervises the construction of the plants.

The Province of Ontario, Canada, has a hydro-electric commission, which has made exhaustive examinations and surveys of all existing undeveloped water-powers and has given its findings to the public; it also receives the requests of communities for electric energy, investigates the market conditions, makes its recommendations to Parliament, which authorizes the issue of securities, with the guarantee of the Province, to cover the construction of transmission lines, the interest and redemption charges being apportioned to the communities receiving service. Southern Germany, Sweden, Switzerland and Italy have inaugurated similar policies, and Japan has only within the year subsidized what will rank for some time to come as the most elaborate and complete water-power development program of any country.

In other words, there is no dearth of precedents, of examples set for any section to follow or improve upon by profiting from the experience of the pioneers in the business of conserving the water-power resources of a country.

The first logical step to be taken by the South toward the securing of an adequate benefit from this, one of their most important resources, in the upbuilding of their industrial development is to exploit them and let the world know what they have.

Not one of the Southern States can today furnish an account of its undeveloped water-powers—that is, one which conveys the information called for by the men who stand ready to invest their money in such enterprises. Not one of the Southern States has taken such an inventory of this valuable asset in a manner to tell the world what they have in this line. It is true the Government has measured the flow of most of the rivers, has made a general estimate of their fall and power capacities; but what of that; where are the available power sites; what are their topographic and geological conditions which control the feasibility and cost; what the storage possibilities, which is really the most important of all features? It can hardly be expected that such investigations will be undertaken by private initiative, which is confined to local conditions only, because the explorations for the more important—the storage feature—are not only too expensive as regards the single opportunity, but of what promise is the result when no encouragement is held out by the State to reward efforts whose beneficial effect will be shared by many other power opportunities on the same stream system?

It is true that the Federal Government controls many of the best power rivers in the South, because navigation works have been constructed on them, and that the National Government should make the investigations to develop their storage possibilities; but will the South wait forever to have this work done for them? The Federal Government has control of navigable rivers in more States than those of the South; it will take them many years, even after such a policy is inaugurated, to cover the field. Why should not the States, individually, enter upon this at once and reap the assured reward the sooner? The State of Wisconsin has recently completed such a water-power survey, consuming some three years, at a cost of less than \$15,000, and today one can obtain a description of these opportunities, giving all the essential details on which projects may be based.

And, secondly, the States should legislate in behalf of water-power developments, perhaps along the lines heretofore cited, not giving away any valuable rights, but securing them to the people of the Commonwealth in the results.

Every horse-power thus developed could find its useful work, transportation would be electrified on rail and canal, electric roads would gridiron the South, cheap power would displace the wasteful sources, and all the branches of industrial enterprises would experience a mighty stimulus.

We are entering upon the electric age, and we are also awakening from a debauch of rioting in plenty and are settling down to a provident administration of our natural resources for our own weal and their preservation for future generations. This is true of the South as of the whole nation, the South with its bounties of all that is rich and plenty within the gifts of Nature. And the South will act and achieve.

The Value of Southern Water-Power Investments.

By FRANCIS R. WELLER, C. E., of Pressey & Weller, Engineers, Washington, D. C.

[Written for the Manufacturers' Record.]

Mr. Weller writes from the standpoint of an engineer in close touch with developmental problems in the South.

One of the richest natural resources of the South is its vast undeveloped water-power. This latent power gives the assurance of future manufacturing growth, needing only the vitalizing effect of capital to make the South the most prosperous section of the country.

The object of this paper is to briefly present some of the many attractive features of such water-power developments for the investor and to outline some points for the guidance of those interested in the development of such water-powers.

It requires no prophetic imagination to see that electricity generated from the power of falling water (known as hydro-electric power) will, as the years go by, become a factor of an ever-increasing importance in the industrial life of this nation.

According to the United States census reports in 1850, the production of coal

amounted to 6,445,000 tons and the population of the country was 23,193,876 persons, or a per capita consumption in that year of .278 tons. In 1900 the production of coal was 269,684,025 tons and the population was 76,303,387, or a per capita production of 3.53 tons. While the population between 1850 and 1900 increased 230 per cent., the production of coal increased 4084 per cent. Already some of our richest coal deposits are becoming worked out, and of late years the price of coal has shown a gradual increase. It is not surprising to see, therefore, such a deep interest shown at the present time in hydro-electric power, which must more and more supplement coal as a source of useful energy.

The majority of the valuable developed and undeveloped waters of the South are situated along the eastern and southern slopes of the rich Piedmont section, within the States of Virginia, North and South Carolina, Georgia and Alabama, while the rivers have a rapid fall into the flat coastal plain. This fall line is well defined, passing through the cities of Richmond, Va., on the James River; Fayetteville, N. C., on the Cape Fear River; Columbia, S. C., on the Congaree River; Augusta, Ga., on the Savannah River; Macon, Ga., on the Ocmulgee River, and Columbus, Ga., on the Chattahoochee River. Each of these cities is at the head of river navigation, and their favorable location with respect to manufacturing is immediately apparent. Above this fall line there are many favorable power sites along these and other rivers. The Tennessee River, one of the largest in the country, has also many favorable power sites.

It is estimated that the total minimum available horse-power that can be economically developed on these Southern streams exceeds 1,400,000 horse-power, without considering the increased power that can be gained by storage. A small proportion of this power has been developed, but hardly enough to make any material showing when the enormous natural resources of the South are considered. In the past few years manufacturing has made wonderful strides in this section, the production of manufactured products increasing from \$457,454,777 in 1880 to \$2,600,000,000 in 1908. While these figures are astonishing, we are fully justified in assuming that the increase will be still greater in the future. This is true with respect to the cotton mill industry. Here we have the source of supply, cheap labor, abundant power, a mild, healthful climate and many lines of transportation to the markets of the world.

In 1880 the number of spindles in Southern cotton mills was 667,754; in 1908 this number had increased to 10,443,761; while for the entire United States the number increased from 10,653,435 to 27,505,402. Southern cotton mills are the largest consumers of hydro-electric power, so the significance of these figures is apparent. Practically all of the new cotton mills now built have installed the electric drive for operating the machinery, and hydro-electric power is used wherever available, while many of the older mills are changing from steam to electricity. One power company is now supplying hydro-electric power to nearly 100 cotton mills, and the service has been entirely satisfactory.

This radical change in the source and application of power has been brought about during the past 14 years, due to the improvements in electrical machinery, especially in the field of high-tension transmission of electricity. The interruptions to service have been reduced to a minimum in the newest hydro-electric plants. Southern hydro-electric plants do not have to contend with ice troubles, which are a source of many interruptions in Northern plants. The rainfall is fairly uniformly distributed throughout the four seasons of the year, and as all the important rivers rise in the Southern Appalachian Mountains, a region almost entirely forested, a fairly uniform river-flow results. At the present writing the prospects are favorable for the passage by Congress of the Appalachian Forest Reserve, which will insure for all time the permanence to these power plants. There are ample reservoir sites along most of the Southern streams for the creation of storage reservoirs to increase the minimum flow, and, with a conservative power rating, the hydro-electric plants should at all times be capable of delivering the amount of power sold.

There are many advantages in the use of hydro-electric power for manufacturing purposes. In the first place, except in rare cases, the use of hydro-electric power will result in a saving in cost of the power produced from steam plants. The cost of steam power in Southern cotton mills varies from \$25 to \$75 per annum, depending upon the cost of coal and the type of power plant installed. With coal at \$3 per ton, few Southern cotton mills are developing power at the present time under \$35 per annum.

In the case of new mills the use of hydro-electric power will eliminate the necessity of a steam-power plant, and the capital thus saved can be used for increasing the size of the mill, resulting in a greater production and greater earning capacity, an advantage over steam-driven plants with the same capitalization.

Some other advantages of the electric drive might be mentioned. The electric drive will result in a saving in cost of the buildings, the jar and vibration of belting and shafting being almost eliminated; hence lighter walls and floors, reduction in power losses, the electric drive being more efficient than the mechanical drive; brighter and cleaner rooms, as overhead shafting is the direct cause of oil drippings, which in the case of textile mills often damages the fabrics and necessitates additional labor in cleaning floors, machines, etc.; increase in speed of machines, giving greater production and less repairs; saving in cost of maintenance—the amount of power used can be easily measured and the cost of production more accurately determined; the chance of total shutdown of the plant is materially reduced by the division into a number of units of the prime movers, in a steam plant all the power used being transmitted by means of one or two main belts and pulleys.

Hydro-electric plants, like other business enterprises, are of little value unless they pay; therefore, the consideration of the commercial side of any projected plant is of the first importance.

The two principal factors that govern the value of a hydro-electric plant are the market for power and the cost of producing power. The problem reduced to its lowest terms can be stated thus: Can the power be sold at such prices which will result in a fair profit on the investment? Every proposed hydro-electric plant must fulfill this test, else the construction of the project is not warranted at the present time.

An exhaustive study of the market should be made preliminary to the carrying out of the project. The market should be capable of using at least a sufficient amount of the available power as to insure the payment of all fixed charges and operating expenses, with good prospects of future growth that will absorb the balance of the available power. A careful canvass of all the industries within the territory served by the power plant should be made and the cost of steam-power in different types of factories determined. The price at which hydro-electric power can be sold will depend upon the cost of producing power from existing steam plants. The price of coal in the

territory is the governing factor, and, as a general rule, the higher the price of coal the higher the price of hydro-electric power. However, in sections in the South contiguous to the coal fields hydro-electric power can be sold at prices that would pay a good return on the investment. The day for cheap electric power in the South is passing, as the manufacturers are becoming to realize its great value and its many advantages over steam power.

Naturally the most valuable water-powers are those located near the large centers of industry. Under certain conditions hydro-electric power can be profitably sold where the transmission covers a considerable distance, due to the amount of power available. The Southern Power Company is a notable illustration of this fact, at the present time selling power over 100 miles distant from their power plant and now extending their lines to cities nearly 200 miles distant. It is obvious that only the sale of hydro-electric power in large quantities would justify this expense.

The character of the power market is also an important consideration. The more uniform and constant is the power load, the cheaper can power be sold. It is also preferable to sell power to a number of diversified manufacturing plants rather than to sell the entire output to one line of industry, in order to insure permanence of the market.

The determination of the cost of steam-power in the various factories involves a great deal of specialized work. It has been almost the invariable experience of the writer in investigating cost production that the mill owners underestimate the cost of their power. It is comparatively easy to determine the gross amount of power used in any given section, but it is extremely difficult to determine the real cost of power. Coal bills and wages are tangible, but interest, depreciation, repairs, water, taxes, insurance, incidentals and power losses are seldom rigorously charged up to the cost of power. These are large items when the power is used irregularly.

From the above it is seen that too much study cannot be given these preliminary investigations. Several large hydro-electric installations have proven failures, due to the fact that the study of the market was not given the proper consideration before the plants were built, the intent in one or two cases being to create the market; but other inducements than merely cheap power are necessary for the creation of a large manufacturing center. In connection with the study of the market consideration should be given to possible, present or future competition. The tendency of the present time seems to be rather in the direction of consolidation of many plants or the development of larger powers than the construction and operation of many small independent power plants. For illustration, it is more economical to supply a market requiring 10,000 horse-power from one power plant of that capacity with 100 miles of transmission lines, rather than to supply this amount of power from 10 plants of 1000-horse-power capacity each, with 10 miles of transmission lines for each plant.

Aside from the study of the market, the preliminary engineering features should be thoroughly studied. Determinations must be made of:

1. The minimum discharge of the stream.
2. The available head on the wheels.
3. The effect of storage or pondage as a means of increasing the power.
4. The maximum discharge and the resulting effects of floods.
5. The character of the river bed and the accessibility of suitable building materials.
6. The character of the drainage area of the stream.

Complete surveys should be made and general plans worked out in sufficient detail to permit an accurate estimate of cost. A hydro-electric power plant is peculiar, when, as usual, no tax is paid on the water used, in showing nearly constant operating expenses irrespective of output; hence if the receipts exceed these expenses and fixed charges, all additional sales of power mean a net profit, but it becomes profit precisely in proportion to its price, so that is usually bad policy after the plant is paying expenses to take on large consumers at low prices, it being more desirable to encourage small consumers by the sale of power at reasonable rates.

The cost of large Southern water-power developments will vary from \$80 to \$150 per horse-power, depending upon the nature of the development, the character of the power-load and its location with respect to transportation facilities. Where the distance of transmission is the same the unit cost of the development will, as a general rule, decrease as the head increases.

Few hydro-electric power plants operate on a higher load factor than 40 per cent., which is equivalent to running the power plant at full load for 10 hours per day. The load factor of Southern mills, the principal consumers of power, is approximately 32 per cent. It is obvious that the higher the load factor the cheaper is the cost of power delivered. When the load factor falls below 20 per cent. a steam-driven electric-power plant is more economical to operate than a hydro-electric plant. The question of load factor, therefore, plays an important part in the preliminary considerations. After these investigations are completed the cost of the power delivered can be readily and accurately determined. The average cost of power delivered to consumers in Southern hydro-electric plants of 10,000 to 20,000 horse-power capacity will vary from \$10 to \$15 per annum.

No hydro-electric power is being sold in the South today under \$20, and then only in large quantities. The average price for power is considerably higher.

With adequate market and favorable natural conditions, there is a good margin of profit in the operation of Southern hydro-electric plants. Unlike most public-service plants, the income, expenses and net earnings can be closely determined in advance of construction. The element of financial risk is, therefore, greatly reduced. Power transmission properties do not have to face the dangers arising from anti-trust legislation, municipal ownership, labor disputes or serious accidents, such, for instance, as any street railway company may have through the collision of two heavily loaded cars; abnormal increase in the cost of raw materials for manufacturing purposes, or ruinous competition.

The ownership of water rights is perpetual, in which respect securities based upon good hydro-electric plants have an advantage over those based upon limited-time franchises. A good water-power may be termed in a sense a limited perpetual monopoly.

The initial cost of hydro-electric plants involves a large outlay of capital and, therefore, the local parties, who in most cases control the undeveloped power site, must enlist the financial assistance of large banking interests in the enterprise. In presenting such a proposition to capitalists all the preliminary investigations above outlined should be carried out. The result of these investigations should be prepared in concise form, accompanied by all necessary maps, plans, tables, etc., that will give all the desired information. Charters, franchises and all flowage rights should have

been secured, Government permission obtained to dam the stream (if the river be navigable) and tentative contracts for power be signed or letters from power-consumers exhibited to show that the required amount of power could be sold.

The hydro-electric field in the South has hardly had a beginning, and large amounts of outside capital must be enlisted in further developments. Such capital could more readily be obtained if Southern business men, especially those most vitally interested in the industrial development of their communities, would subscribe liberally for the purchase of hydro-electric securities. By so doing they would show their faith in the merit of such investments and also would assist in the upbuilding of their locality. Subscriptions, say, to one-fourth of the bonds, presented with the prospectus to the bankers, would, if the project be a meritorious one, practically insure the financing of the power plant.

The South needs an abundant supply of efficient power, and as the growth of manufacturing in this section continues to increase the enormous potential wealth of her undeveloped water-power will become more and more appreciated.

The Meaning of the Panama Canal to the South.

By JOHN BARRETT, Director of the International Bureau of American Republics.
[Written for the Manufacturers' Record.]

Mr. John Barrett, who was originally from Vermont, and a graduate of Dartmouth College, after journalistic experience in Oregon, on the Pacific Coast, entered the diplomatic service of the United States in 1894 as Minister to Siam, and since then as special diplomatic and commercial representative in Siam, Corea, Siberia and India, as Minister to Argentina, to Panama, and to Colombia, as Commissioner-General of Foreign Affairs of the St. Louis Exposition, and on other lines has been active in efforts to promote the commercial expansion of this country. As director of the International Bureau of American Republics, with headquarters at Washington, he is now rendering valuable service in strengthening the mutual relations of republics on this hemisphere.

The manufacturers and business men, in fact, all loyal residents who have the interests of the South at heart, should consider it well worth their while to look at the present, and particularly the future of their country, from every point of view. This is an industrial age, and the welfare of the world, as well as that of any particular area, must depend upon the uses to which it puts its industrial opportunities. This applies with great directness to that section of the country we call the South. Let me, therefore, restrict these remarks so as to make them particularly applicable to the readers of the MANUFACTURERS' RECORD.

That the South has within the past few years experienced a great awakening is a statement containing so much truth that it is apt to become trite. Anyone making a trip through the regions below the Ohio River will have this truth emphasized in the most astonishing way when he sees the great improvements already accomplished or projected in every direction. The South has become one of the great factors in the growing strength of the nation, and the natural resources there have only begun to be appreciated. Already they are beginning to reach out for something besides local markets. The coal and the iron are going all over the country. The output of the factories is sold farther and farther away from home, and these products must be exchanged for products originating elsewhere. This is to a great extent a problem for immediate solution. The MANUFACTURERS' RECORD has well said in one of its recent issues that "rail, river and road transportation have not kept up with the world's advancement. In fact, we have scarcely begun to handle, as it ought to be handled, our rapidly expanding trade."

As far as the matter of railroad facilities is concerned, there is no doubt whatever but that the railroads, with that keenness which has always characterized them, will give a good account of themselves to the interests they serve. But it must be confessed that we have not dealt with our rivers as we should have done. Some weeks ago at a meeting of the Rivers and Harbors Congress a broad and comprehensive handling of the waterways of the country was projected. If this scheme is followed they will be developed so as to place them in the best possible condition for the traffic they are to carry. All statesmen and far-sighted students are well aware how necessary it is to make use of these waterways. In our own country a study of the topography of the land shows how naturally the waterways tend toward the South. The great Mississippi, to which are tributary the Ohio on the one side and the Missouri on the other, carries everything to the South, and is ready to carry her own products farther out to sea. On the Atlantic there are such big rivers as the James, which, it would seem, Nature has supplied as a means of facilitating commerce. The South, therefore, has all the elements ready for future industrial prosperity, as the South, quite as much as any other section of the country, is bound to have its share in every phase of industrial expansion.

But when the railroads are built interstate commerce is a matter that will take care of itself. When the waterways are utilized in conjunction with the railways for this traffic, when local consumption is well supplied, what is to be done for markets if there is given no thought to the possibilities beyond the local borders? This is a question, as I implied at the beginning, which is as vital as any of the others. The South must prepare to take its due portion of the great trade beyond sea, and this lies waiting—it should be observed—at the South's very doors. The South must make a united and continued effort for railway improvements, for all means to make use of these great rivers and waterways, but this must be done during the time that the Panama Canal is being constructed.

It will be disastrous for the trade and prestige of this great section of the United States if it finds itself a few years hence unable, on account of its shortsightedness, to compete with Europe and the rest of the world in taking proper advantage of the Panama Canal. If the South does not look ahead it will not be able to carry its product to the markets which the Panama Canal offers.

There are no important European countries, and be it said to their credit, which are not preparing to gain every advantage possible from the Panama Canal; even Japan is laying her plans for steamships to the east coast of South America via the Canal, so that she will have entrance to that mighty field of trade.

I wish, therefore, without unwarranted enthusiasm, to point out my confident belief that the next 10 years will be a Latin-American decade, and that the next generation will see, if we plan carefully now, an intimacy between the Mississippi Valley

and South America little dreamed of a few years ago. The South will see a material, economic and intellectual advancement in Latin America which will rival what has been accomplished in the United States. Trade can naturally be directed out of the Gulf of Mexico and into the Atlantic Ocean along the east coast of South America, but, while I do not wish to ignore the great possibilities in that direction, the field is vast enough for the moment if we can confine our attention to the area opened to the South by the Panama Canal.

The geographies will show that it is only a trifle over 1200 miles—not much farther than from New Orleans to New York—from any of the South's splendid harbors to the Isthmus of Panama. Once through the 50 miles of canal separating the Caribbean Sea from the Pacific Ocean, there is an immense stretch of South America which has made astonishing progress industrially, but which will make still greater progress when the Canal is opened.

This area comprises the republics of Colombia, Ecuador, Peru, Bolivia and Chile. The South has never been able to reach these countries directly. The chief Pacific harbor of Colombia, Buenaventura, is only 355 miles away; Callao, in Peru, 1337; Mollendo, which is one of the chief receiving harbors for Bolivia, is only 1771 miles from Panama, and Valparaiso, in Chile, is 2608 miles from Panama. These countries challenge our best study and appreciation. They are gifted with a variety of climate and resources; they are blessed with a marvelous intermingling of cool plateaus and tropical lowlands, with a long extent of accessible coastline, and they supply numerous important products which the rest of the world must purchase. Their peoples are of deep sympathies and high intellectuality, based on an old and worthy civilization.

The nearest neighbor in South America is the great republic of Colombia. I desire to go on record as believing that Colombia will experience a material development like that of Mexico, and that in proportion to area and population it is as rich as any in variety and extent of undeveloped resources and opportunities. Colombia is nearer than Panama to the majority of Atlantic and Gulf ports of the United States, but there is a wide section of the country with wonderful possibilities on the Pacific waiting only for the Canal to be built. The size of Colombia, too, should attract notice; its area is 504,000 square miles—larger than many of the States of the South merged into one; her population is now not more than 4,000,000, but she can easily support 40,000,000. Last year the foreign trade of Colombia was more than \$25,000,000, of which the United States took not quite \$10,000,000; but these figures should be doubled when the canal is built. The mineral and agricultural resources in the republic are attracting unusual attention. The banana industry is developing most satisfactorily; ivory nuts, for buttonmaking, are collected in great quantities and sent to Europe; the platinum and other precious metals are easily accessible for international exportation; the straw from which Panama hats are made is one of the great products. Most of these articles should flow naturally toward the South to exchange for such manufactures as the South may easily supply.

Ecuador, the next country to the south, with an area of 116,000 square miles, is larger than Illinois and Iowa together. The interior of the republic has just been thrown open by the completion of the railway between Guayaquil and Quito, the capital, in the mountains. The foreign trade of Ecuador in 1907 was over \$20,000,000, of which the United States received barely one-fourth. Steamers from Europe passed clear around the Horn to reach the chief seaport. In 1906 there were 96 English and 33 German, but no American steamers entered at Guayaquil. All this should be changed when the Canal is opened, but if we do not take our share of the trade of the republic Europe will be the only gainer by making a short cut past the very doorway of the United States and through Panama. Ecuador produces one-fifth of the world's cacao (cocoa), ranking next to Brazil. It is the staple product of the country, the output in 1906 being 51,000,000 pounds. Rubber, coffee and ivory nuts are other staples. Ecuador is rich in mines, and when her industries become more developed and the possibilities better known she will from this source also add to the riches of the world. There is no sense in ignoring the opportunities here. There should be a natural exchange of commodities between Ecuador and the South.

Peru, with 713,000 square miles, larger than all the Atlantic Coast States from Maine to Florida and the fourth republic in size in South America, had a foreign trade in 1907 of \$50,000,000, of which the United States took \$14,000,000. Peru has always been a great rubber and cacao country; she also produces wool of various kinds, and her agricultural possibilities are extensive; but, in addition to agriculture, Peru has wonderful mineral resources. Her output in 1906 of copper was \$5,000,000; of silver, nearly \$5,000,000; of gold, nearly \$1,000,000, with other products, such as coal, lead, quicksilver and antimony. All this Peru, with her 4,500,000 inhabitants, is ready to exchange for the manufactured products she needs, and the South is entitled to all her energies will secure for her.

Bolivia, that great inland republic, the third in size in South America, with an area of 729,000 square miles, more than twice the size of Texas, with the States of Mississippi, Louisiana and Georgia added, must no longer be ignored by those who have any imagination for the future. Her foreign trade for 1907 is close to \$50,000,000, of which the United States supplied only \$13,000,000, yet, with her inexhaustible resources scarcely developed, her 2,267,000 inhabitants produce much that the South needs, and in exchange she is able to consume much that the South might supply. At present Bolivia is a mineral country; of tin she exported \$18,000,000; of silver, \$2,375,000; of copper, \$2,650,000; bismuth and gold in like proportions; of rubber, \$5,300,000; but much of this flows for the present toward the Atlantic Ocean because transportation facilities on the Pacific are lacking. Here will be shown the influence of the Panama Canal when it is able to offer a specific gateway to Bolivia, and all that is necessary for the South to do is to study the markets of the republic and be ready to supply them when occasion offers. It is very pleasant for me to add that United States capital and enterprise have taken hold of the problem of railway construction in Bolivia and that \$1,000,000 is being invested there; before the South is aware of it this great republic will be modern in every respect.

Chile, the California of South America and the seventh in size of the republics, has 291,000 square miles and is considerably larger than California, which State it well resembles in many characteristics. Its climate is much the same; its minerals and agricultural resources are much the same, and in industrial activities Chile's 3,500,000 inhabitants can make a good showing with any similar people in the United States. Her foreign commerce last year was \$209,000,000, of which the United States took a little over \$29,000,000. The great export staples from this country are minerals, which amounted to \$88,000,000. She sent \$13,000,000 of nitrate salts to the United States.

The South needs much that Chile produces, and Chile can consume much that the South supplies if trade through the Panama Canal is fostered.

It must not be forgotten that the Canal will make more accessible to the South all the Western Pacific territory of the five Central American Republics and of Mexico. On this slope of the central mountain range lie many of the chief cities of Latin America north of the equator, and commerce has for generations taken the easier channels toward the Pacific Ocean and thence, by the tremendously long journey around the Horn, to the markets of Europe. Some of these settled areas, like the Republic of Salvador and the Valley of the City of Guatemala, are the most thickly populated in Latin America. Their productive capacity is increasing. They are exporting more and buying more each year. The trade in tropical products has grown wonderfully within the last 10 years, that of tropical fruits, largely from Central America, having increased 100 per cent. Much of this comes to Southern ports, but when the west coast is also reached by vessels direct from these harbors the trade can again be doubled by reasonable effort.

All of these commodities the South needs, and in exchange they are willing to take what the South is prepared to sell. If, therefore, the manufacturers or exporters of the South intend to enter the Latin-American field, they should first make careful study and investigation of the business, economic and social conditions down there. If they make this investigation by sending trustworthy representatives they can get the best conclusions. In selecting men, however, to familiarize themselves with Latin America or to build up trade there, those should be chosen who have a thorough knowledge of Spanish and of the way to treat Latin-Americans. They should be men of pleasing personality and address and know how to look at all things from the standpoint of the natives. Otherwise they will fail. If, moreover, any of the Southern manufacturers or exporters could afford to make a visit to Latin America, just as they now go to Europe, they would obtain a vast amount of information that would be most helpful.

Closer acquaintance and friendship between two sections of the world can only be brought about by favorable conditions of communication. If we want to build up our trade with our Latin-American neighbors we must make it easy, convenient and comfortable for their business men, their travelers and their tourists to come up here, and for ours to go down there. Without discussing the much-mooted question of "subsidies," the fact remains that it is just as necessary for the promotion of trade that we should have fast mail, passenger and express steamers across the Gulf of Mexico as it is that we should have fast mail, passenger and express railroad trains on land. Just as any great city in the United States could never become a large commercial entrepot if it depended on freight trains to carry its mails, passengers and express, so, in the same way, our Gulf ports can never get into intimate association with their neighbors if we are dependent merely on slow-going freight carriers for communication.

In conclusion, let me invite the business men of the South to make use of the International Bureau of American Republics, at Washington, D. C., for the purpose of obtaining full and complete information about these countries and in co-operating with them for the advancement of Pan-American commerce and comity. The Bureau is a great international institution, supported by all the American republics, including the United States; it is non-political in character. A dignified and useful existence has characterized its life since it was first established, 19 years ago, but it has never accomplished the work originally intended, largely on account of the lack of interest of the United States and the other governments. Now a new era has dawned and the credit is due to Elihu Root, our distinguished Secretary of State. In his wonderful journey around South America he made both North and South America realize the importance of getting into closer relations with each other.

Problems Fronting Railroads in South Atlantic States

By J. T. ODELL.

[Written for the Manufacturers' Record.]

Mr. J. T. Odell, who was formerly general manager of the Chesapeake & Ohio Railway, and also of the Baltimore & Ohio Railroad, has acted for some years as adviser for financial interests in New York. He is the president of the Marquette & Bessemer Dock & Navigation Co.

The railroad situation in the South at present is such as to demand the deepest and most thorough consideration. With the prospect—practically guaranteed—that there will be enormous increases in industry, agriculture and commerce during the next decade it is necessary that Southern railroads shall be in position to spend from \$1,000,000,000 to \$2,000,000,000 for the improvement and modernization of their lines, terminals and equipment within 10 years. This means that legislation concerning railroads must be of a just and liberal character, and not of a nature to restrict and embarrass them. I believe that if the business interests fully understood the perilous position they are in with these present-day railroads of high grades they would demand a repeal of unjust laws. It is either that or move out of the country; no country on earth could be developed without transportation facilities. The ton-mile freight rate is too high. It must be reduced, but the ton-mile cost must be reduced in greater proportions. The economical capacity of the railroads must be increased, producing a lower ton-mile rate, or the business interests are at the end of their line. That is what I read in the annual reports.

Considering the facts which lead up to these conclusions, one must remember that the United States produces more than it consumes, and the surplus products of the forests, the soil, the mines and of the animals must go abroad, and the question whether these commodities can go out of the country at a fair profit is the question of freight rates. The spread between the freight rate and the selling point is so narrow that the slightest upward move of the rate will shut off shipments and throw the surplus back on to the country, thus paralyzing business. This is the interest which every inhabitant has in the question of transportation. The railroads are making a determined effort to advance the rates, but I doubt if 5 per cent. of the officials take themselves seriously. The argument is that if the ton-mile cost cannot be reduced the ton-mile rate must be advanced, yet it is a known fact that only certain commodities will stand any advance, and how to single out these commodities is the problem. The tendency of the rate is

downward, and the cost of operation upward. The transportation candle appears to be burning at both ends.

The expression "ton-mile cost" carries with it much more than would appear to one who reads the words in print or who hears them spoken. I will explain it in detail. Railroads are constructed for carrying freight and passengers, or, in other words, for what freight and passenger trains will earn. The operating expenses are divided between freight and passenger (generally for accounting purposes only), as all the public wants is the total of these expenses. The method of dividing is based on either the locomotive mileage, the train mileage or the car mileage.

My reading of a certain report indicates that 65 per cent. of the expenses is chargeable to freight and 35 to passengers. This means that 65 per cent. of every cost up to the interest is paid from the earnings of freight trains. If the cost of the legal department or if the general expenses are high, it goes to increase the ton-mile cost and places a heavy burden on the freight trains. The freight traffic must be handled at the very lowest cost in order to carry the burden. One can imagine how many freight trains on an 80-foot grade it will take to meet 65 per cent. of every expense of a great railroad, including the interest on its bonds and dividends on its stock. Especially is this problem more interesting when you consider that, as a rule, less than 10 per cent. of the mileage is earning revenue. For example, a road whose annual reports I have lately studied operates over 2000 miles of track, yet when the traffic is consolidated only 150 miles is earning revenue, and its average haul compares very favorably with the other roads of the country.

If there is any expense in any department of a railway that is unnecessary it goes toward increasing the ton-mile cost, and may be very properly set down as deadweight. The greatest responsibility attached to the management of any important railway is the responsibility of handling the property for immediate net results and still look ahead not less than 10 years. A good many managements look for immediate results and overlook the future; are not certain of their tenure of office, and look out that their successors do not make any record at their expense. In this way deadweight accumulates until finally the courts are asked to take charge of the property and give the owners a chance to clean up the deadweight and take a fresh start.

The United States as a unit will naturally increase its population $2\frac{1}{2}$ per cent. per year and its traffic by much larger figures. Some communities will recede, some stand still and others advance away beyond the average of the country. Especially is this latter statement true of that portion of the country engaged in producing commodities for export, as the South, for example. Therefore, if these States are to keep pace not only with the growth of this country, but also with the growth of the consuming population of the rest of the civilized world, they must look ahead not less than 10 years in the matter of developing the railroads. In studying the railroad situation and its needs in the South I have carefully analyzed annual reports for a number of years. I find that in 1901 three great systems in the South carried something more than 21,000,000 tons of freight, and in 1907 they carried nearly 41,000,000 tons, an increase of nearly 20,000,000, or more than 90 per cent. After adjusting the mileage so as to make comparison on a proper basis, the increase was between 60 and 70 per cent., or nearly 9 per cent. per year. One of these systems increased 60 per cent. without any material change in mileage, in rate or in distance hauled.

The character of the country served by these systems indicates a continuous increase in tonnage, provided the railroads are able to withstand an increase, which I very much doubt unless they rehabilitate the properties along modern lines. Therefore, by every known law governing commerce the tonnage of 1918 should be at least 64,000,000 tons, this being an increase of only 6 per cent. per year, and as all the systems were very badly congested with 40,000,000 tons, what is to become of them with 64,000,000 tons?

In the period referred to, namely, 1901 to 1907, there were fairly good conditions, some dull periods and some abnormal conditions, but the period as a unit was a good average. Here is what happened to one of the systems while doing its share of handling the 9 or 10 per cent. increase per year. The gross earnings increased \$22,000,000, the tons handled increased 10,000,000 tons, the bonded debt increased \$77,000,000, the net earnings increased only \$1,641,855, and the dividend on the preferred stock was passed for the purpose of meeting interest on new debt during the most prosperous period in the history of the country and in spite of \$22,000,000 increase in gross earnings. At this rate, what is to become of the property 10 years hence, with the probable growth of freight tonnage estimated, as here stated, upon a very conservative basis? The company must be prepared to do its share of handling the increased tonnage, or else it must throw up its hands in despair at its inability to cope with the problem. This will give the producers a chance to move out and others to not move in.

The simple solution of this great problem is that the railroads must be rehabilitated along modern lines, instead of increasing their capacity along antiquated lines. The deadweight must be removed, the ton-mile cost reduced and 64,000,000 tons must be handled with greater ease and at a far less cost than 41,000,000 tons were handled in 1907.

I do not want to be considered as criticising; the managements are not at fault. The great prosperity of the South practically came over-night. There was no time to work out and finance a comprehensive plan to modernize the properties, as that would mean the relocation of portions of the lines in order to get the grades down somewhere near the ground; they simply had to go ahead and do the best they could, and this was the situation with all the properties in this territory.

The fate of the Seaboard Air Line is illustrative of what is meant by whether a railroad is able to withstand an increase in tonnage or not. It is very evident that prosperity itself was the cause of the receivership. Neither an individual nor a company can enjoy prosperity unless in good physical condition. The question naturally arises as to the cause of the failure. Calling attention to the increased cost of fuel, of general supplies, of labor, etc., does not answer the question nor satisfy those who are interested, because all roads have these questions always before them. The company was weakened by the deadweight which produced a high ton-mile cost. The earnings per ton of freight were \$1.77 and the cost per ton was \$1.33; the ton-mile rate was 10 mills plus, and the ton-mile cost 8 mills plus. While these figures may be subject to slight revision, they are very nearly exact. None will say that a modern-built railway would not reduce the cost 33 cents per ton, or more than \$2,000,000, for 1907. Even then the ton-mile cost would be greater than the ton-mile rate from Norfolk northward.

About the time that prosperity was at its height and most of the roads in the country were prosperous, while those roads which had been modernized had increased their

dividends or had started to pay dividends, the railroads of the South were struggling over hills and mountains with from one to three locomotives on each train, pulling then only a moderate load, making money on certain commodities and losing it on other classes of freight, especially on bituminous coal, which was necessary for the development of the industrial portion of their territory. Then the Hepburn bill became a law and a number of the Southern States opened an attack on the railroads and demanded a lower passenger rate. The Hepburn bill had closed down on free transportation and the people generally lost interest in railroads in consequence thereof. This caused the railroads to put their orators on the stump and their statisticians at work. About this time labor, which always keeps in close touch with the gross earnings of the roads, called for more money. The Southern lines, with all of the increase in business, by reason of physical handicaps were barely able to meet the interest on the cost of increasing their facilities (such facilities were made necessary to keep up with the march of prosperity in their territory); they were congested at every point, losing money at some points and making a little at others, but the net result not sufficient to give stockholders anything.

I happened to be in the South when agitation was at its height, and I was told that the business men of a certain city had signed a telegram in a body, addressed to the Governor of the State, begging him to cease his attack on railroads and stating that all they asked was better service. I conferred with business men of many important cities; none of them complained of the rates, but all of them complained of the congestion.

I again call attention to the congested condition of these $1\frac{1}{2}$ per cent. grade railroads, handling about 41,000,000 tons of freight in 1907, and I wonder what will become of them and their territory in 1918 unless they are let alone and modernized, that they may be ready to handle 64,000,000 tons of freight. What is true as to these roads is largely true as to many others. The possible traffic in the South awaiting railroad development along thoroughly modern lines of low grades, efficient operation and ample facilities is almost beyond calculation. Without vastly enlarged railroad facilities and the practical reconstruction of many lines the progress of the South would be almost halted. When this situation is realized, as it soon will, the problem will be met and solved, but all the energy and co-operative spirit of the people and the railroad powers will be needed in bringing this to pass.

RAILROADS IN THE UPBUILDING OF THE SOUTH.

By W. J. MEANY.

[Written for the Manufacturers' Record.]

Mr. Meany has for many years been engaged in New York in statistical and historical work dealing with public service corporations of this country, and his writings have the stamp of expert knowledge.

To the railroads more than to any other agency, probably as much as to all other agencies combined, our country owes its present position before the world. Only by looking back at the conditions prevailing on this continent before the arrival of the iron horse can the present generation form any conception of its indebtedness to that patient drudge. Ours is a land of tremendous distances, and without the means of abridging them the development of her resources never could have been satisfactorily attempted. With few good harbors along her coast and her rivers flowing to inconvenient outlets, water transportation was next to useless, and in land transportation the world had not advanced beyond the methods of the Romans.

Between the first settlement of the country by men of our race and the opening of the first piece of railroad more than 10 generations of Americans—hardy, resourceful, resolute people, the kind that have solved all our knotty problems—lived their lives and put forth their best endeavors without materially subduing the wilderness around them. Seventy-five years ago the great bulk of our people were settled upon a narrow belt of territory stretching along the Atlantic Coast. Such settlements as had been made in the interior were mere spots in the wilderness. Nowhere did they touch the Eastern settlements, at least 100 miles of mountainous country lying as a barrier between. The Valley of the Mississippi, according to De Tocqueville, was then a mighty desert, and of the vast region stretching westward to the Pacific Slope our own Irving painted a picture of darkest hue, likening it to the wastes of the ocean or the deserts of Arabia, and predicting that, like them, it would ever remain subject to the depredations of the marauder.

The principal occupations of the inhabitants of the interior were hunting and fishing, such crude attempts as were made at farming and manufacturing being merely to satisfy personal or local wants. Then, as now, our highways were the worst in the world, but were they the best, goods could be moved but limited distances over them with profit to the shipper. Every day during the year 1907 the railroads of the United States moved 4,660,000 tons of freight. Over earth roads, were it possible to construct them strong enough to bear such traffic, the movement of such a volume of freight would call for a train of 3,728,000 double trucks, which would extend almost three times across the continent, and it would take a year for the first truck, with its $1\frac{1}{4}$ tons of freight, to reach San Francisco and return to New York. The value of $1\frac{1}{4}$ tons of freight would average something more than \$30, while the cost of transporting it over ordinary highways would be about 30 cents per mile, so that by the time the freight reached Philadelphia its value would be consumed in cost of transportation.

The great staples, wheat and corn, will bear transportation over ordinary roads only 250 miles and 125 miles, respectively, when the value of the one is \$1.50 per bushel and that of the other 75 cents per bushel at the market. The railroads, by transporting at one-twentieth the cost over earth roads, give marketable value to wheat grown 5000 miles inland and to corn grown 2500 miles inland. The effect of this is well illustrated in the extraordinary development of the waste places visited by Irving and De Tocqueville, in the room of which a number of sovereign States have been erected, the population of which is fully 16,250,000, their wealth about \$25,000,000 and their railroad mileage about 48,000.

It is not the purpose of this article to repeat the story of the beginnings of our railroad history or to dwell upon the struggles and discouragements that fell to the lot of the early promoters. The purpose is to show what has been accomplished in the development of the railroad system and the consequent development of the resources and wealth of the country since the period of the Civil War, and especially

within the past 20 years. Suffice it, therefore, to say that the system had its birth in the construction of the Baltimore & Ohio Railroad; that it advanced but slowly until the discovery of gold in California gave the first real impetus to its rapid extension, and that at the beginning of the war its length was about 31,000 miles. It is interesting to note that in the territory about which Irving wrote there still was not a mile of railroad laid, the regular population being less than half a million, and that the great State of California could boast of no more than 23 miles of local line.

The war between the sections was a blessing in disguise, inasmuch as it caused the North to extend the railroad system to the Pacific and the South to effect a complete revolution in its industrial system. With the opening of the Pacific Railroad the waste places immediately began to fill up, sources of wealth hitherto undreamed of being discovered in them. This necessitated the construction of branches and feeders, which quickly spread in every direction, opening new sources of wealth—virgin lands, primeval forests, rich and inexhaustible mineral deposits. Other transcontinental lines, with their attendant branches and feeders, were quickly undertaken and pushed to completion, every known pass of the mountains being utilized. The latest undertakings of the kind are the St. Paul's extension to Seattle, which is now in operation to Butte, in Montana, and rapidly pushing westward; the Western Pacific Railway, of the Gould system, under construction from Salt Lake to San Francisco, and the San Pedro, Los Angeles and Utah Railroad, completed early in 1905, from Salt Lake to Los Angeles and San Pedro, in Southern California.

The transformation of the South from a largely agricultural section to one of widely diversified industries was effected more quietly, but not less thoroughly, than was the reclamation of the "Great American Desert;" and in the one case as in the other the railroad was the instrument of progress. The war left the South bleeding and exhausted, but with courage undaunted and with faith in her high destiny unimpaired. Her industrial system was disorganized, her wealth almost extinguished, her transportation facilities, which had compared favorably with those in the North, as good as destroyed; but, accepting the situation in the true American spirit, she set cheerfully to work repairing the waste and building for the future. One of the first necessities was a comprehensive system of transportation facilities, and, of course, this could be acquired only by reconstructing and extending her lines of railway. Accordingly, capital was coaxed in and work actively entered upon, with the result that, instead of the 12,500 miles of disconnected and crippled railways with which she started, she now has a system more than 70,000 miles in extent, in which practically nothing of the old roads is left.

The first and necessary step in the development of the railroad system was the consolidation of short local roads into through lines and the formation of companies with greatly enhanced capital. In this way was it made possible for the Norfolk & Western, the Chesapeake & Ohio, the Southern Railway, the Atlantic Coast Line, the Louisville & Nashville, the Seaboard Air Line and the other great railroads to render the inestimable service they have to the country through which they extend. Another and most important step was the narrowing of the railroad gauge from five feet to the Northern and Western standard, thereby removing the great impediment to free intercourse with the rest of the nation. The establishment of shipping terminals at Newport News, Savannah, Brunswick, Tampa, Mobile, Gulfport, Port Arthur and various other ports is a service to the entire nation and one on which the railroads of the South might well plume themselves. To meet the constantly growing requirements of the traffic the railroads themselves have been improved by providing industrial spurs, additional or enlarged terminals, passing tracks, shop facilities, block signals, enlarged stations, warehouses, elevators, docks and wharves at water terminals; by widening excavations, strengthening embankments, putting in additional tracks, heavier rail, rock ballast and new bridges; by reducing grades, eliminating grade crossings, straightening curves and by substituting heavier engines and larger cars for those previously used.

Among the more important shipping terminals constructed in recent years are those at Brunswick, Ga.; at Gulfport, Miss., and at Port Arthur, Texas. The Brunswick terminals are owned by the Atlanta, Birmingham & Atlantic Railroad Co. They embrace a half mile of deep-water frontage and contain two large piers, one of them 700 feet and the other 400 feet in length; a lumber basin, or slip, 1600 feet long, and four large warehouses. A line of freight steamers operates between Brunswick and New York and Boston, and another line between Brunswick and Havana. The Gulfport terminals were constructed by the Gulf & Ship Island Railroad Co. under a contract with the United States Government, under which a channel has been dredged to the width of 310 feet and the depth of 24 feet from Gulfport to deep water, a distance of about seven miles. An anchorage basin of the depth of the channel and one-quarter by one-half mile in area has been constructed, the main pier of which is more than a mile long. Sailing vessels have used the anchorage and docks since January 25, 1902, and ocean steamships since November 15, 1902. The harbor was turned over to the United States on June 11, 1907, and has since been maintained at the expense of the Government. The Port Arthur terminals have also been turned over to the United States Government. They were constructed by the Kansas City Southern Railway Co. or by its predecessor, the Kansas City, Pittsburg & Gulf Railroad Co. Port Arthur having been declared a port of entry, the railroad company dedicated the terminals to the Government "to avoid the expense of dredging and maintaining the canal."

The Florida East Coast Railway Co. purposes to construct an ocean terminal at Key West, which will consist of one large drydock and 10 wharves, each 800 feet long and 100 feet wide, with basins 200 feet wide between. The depth of water in these basins will be from 20 to 40 feet. The piers will afford berths for 40 vessels averaging 400 feet long. As the distance from Key West to Havana is only 90 miles, the transportation of freight and passenger cars by means of powerful steam ferries is entirely practicable, and it is believed that the time consumed in the trip will not exceed six hours.

The more important railroads constructed during the 10 years 1898-1907 were the following: The Mobile & Ohio's extension from Columbus, Miss., to Montgomery, Ala., 167 miles; the Seaboard Air Line's extensions to Richmond, 102 miles; to Birmingham, 200 miles; to Savannah, 138 miles, and to Jacksonville, Fla., 113 miles; the Kansas City Southern's extension to Port Arthur, Texas; the Louisiana & Arkansas Railway, from Hope, Ark., to Alexandria, La., and branch, 225 miles; the Atchison's Cane Belt, Beaumont, Pecos Valley and Jasper lines, all in Texas, about 508 miles; the Tennessee Central Railroad from Nashville to Harriman, Tenn., and to Hopkinsville, Ky., with branches, 200 miles; the Atlantic, Valdosta & Western Railway, from Val-

dosta, Ga., to Jacksonville, Fla., 110 miles; the Gulf & Ship Island Railroad, from Gulfport to Jackson, from Moxie to Mendenhall, and branch to Laurel, all in Mississippi, 307 miles; the Midland Valley Railroad, mostly in Arkansas, 300 miles; the Western Maryland's Cumberland extension; the Baltimore & Ohio's West Virginia Short Line; the Central of Georgia's Bruton and Pineora line, and the Chattanooga and Gulf extension of the same system; the Atlanta, Birmingham & Atlantic Railroad, from Brunswick, Ga., to Birmingham, Ala., with branches to Atlanta, Waycross and Thomasville, Ga., 650 miles; the Georgia, Florida and Alabama Railway, from Tallahassee, Fla., to Cuthbert, Ga., with branch 120 miles; the Louisville & Nashville's extension from Atlanta to Knoxville; the International & Great Northern's extension to Fort North; the Frisco's extension in Arkansas, Oklahoma and Texas; the Choctaw, Oklahoma & Gulf Railroad, from a point opposite Memphis through Arkansas and Oklahoma to Texola, on the Texas State line, with various branches and extensions, 1008 miles; the Chicago, Rock Island & Texas Railroad, in Oklahoma and Texas, 470 miles; the Little Rock, Arkansas & Louisiana Railroad, from Eldorado to Haskell and Crossett, Ark., and to Wirand, La., 252 miles; the Florida East Coast extension, from Miami to Knights Landing, 112 miles; the Louisiana Railway & Navigation Co.'s extension from Angola to New Orleans, 130 miles; the Missouri Pacific's White River Division, 280 miles, its Houston, Central Arkansas and Northern line, 190 miles, and its Memphis, Helena and Louisiana line, 235 miles; the Kansas City, Watkins & Gulf Railway, from Lake Charles to Alexandria, La., 100 miles; the Trinity & Brazos Railway, from Cleburne to Houston, Texas, 236 miles, and from Teague to Waxahachie, Texas, 67 miles; the St. Louis, Brownsville & Mexico Railway, from Alcoa to Brownsville, Texas, and branch to Fordyce, 400 miles, and the Coal & Coke Railway, from Charleston to Leiter, W. Va., and from branches, 191 miles. The latest extensions undertaken and some of which have been completed are the New Orleans Great Northern Railroad, from New Orleans to Jackson, Miss., with various branches, 300 miles; the Frisco system's line, from Houston, Texas, to Baton Rouge, La.; the Florida East Coast extension along the keys and over the ocean to Key West; the Illinois Central's extension to Birmingham; the Tampa Northern Railroad, from Tampa to a connection at Thomasville, Ga., with the Atlanta, Birmingham & Atlantic, which is owned in the same interest; the Savannah, Augusta & Northern Railway, projected from Savannah to Chattanooga, with a branch to Augusta; the Georgia & Florida Railway, projected from Columbia, S. C., to Madison Fla., with a branch toward Savannah, about 500 miles; the Virginian Railway, from tidewater at Norfolk to Deepwater, W. Va., 442 miles, and the Carolina, Clinchfield & Ohio Railway, projected from Spartanburg, S. C., to Elkhorn, Va., about 325 miles.

The extension of the Virginian Railway from tidewater to the mineral fields of West Virginia; of the Atlanta, Birmingham & Atlantic to the Alabama coal and iron fields; of the Clinchfield & Carolina through the difficult foothill country between Spartanburg and Elkhorn, and of the Florida East Coast along the keys and over the open ocean to Key West are works that rank with the highest achievements in American railroad engineering and construction. The Virginian and the Clinchfield & Carolina set a new standard for high-grade construction. The Key West extension is the most unique and probably the finest stretch of railroad in the country. It is virtually a railroad over the sea, almost two-thirds of its length being over water and a considerable part over the sea itself. The present terminus at Knights Key is practically a port in the ocean, the ships of the Key West and Havana lines of the Peninsula & Occidental Steamship Co. making it their northern terminus. Nearly 30 islands are used for short stretches of the construction, the longest being 16 miles, on Key Largo. Where the intervening water is shallow, rock and earth embankment is built, but where it is deeper and the openings are exposed to storms by breaks in the outer reef, concrete and viaduct construction is used, consisting of 50-foot reinforced concrete circular-arch spans and piers, with occasional spans of 60 feet. This was the most difficult part of the work. The water is from 10 to 30 feet deep in most places, the bottom being coralline rock. There are four of these arch viaducts, aggregating 5.78 miles in length. In many places the embankment for the roadway is eight or nine feet in height, and the roadway is ballasted with coralline limestone, with the result that it is one of the finest and softest railway roadbeds in the world. The final section, from Knights Key across the open ocean to Key West, is now under construction. While this remarkable railroad will be one of the most expensive projects of the kind ever attempted, it is expected to result in the development of Key West into a seaport of the first importance.

The following statement will show as between the year 1887, when the revival of industry in the South first became noticeable, and the last year for which returns are available, the growth of the railroad system in the territory south of the Potomac and the Ohio and in part of the Southwest that is popularly regarded as Southern territory:

	Railroad mileage.		Increase.	
	1887.	1907.	Miles.	Rate P. C.
Virginia.....	2,778	4,155	1,377	49.6
West Virginia.....	1,230	3,185	1,955	158.9
North Carolina.....	2,318	4,367	2,049	88.4
South Carolina.....	1,884	3,330	1,446	76.8
Georgia.....	3,490	6,780	3,290	94.3
Florida.....	2,178	3,997	1,819	83.5
Total.....	13,878	25,814	11,936	86.0
Alabama.....	2,713	4,924	2,211	81.5
Mississippi.....	2,133	3,908	1,775	87.9
Tennessee.....	1,463	3,768	2,305	157.5
Kentucky.....	2,275	3,471	1,196	52.6
Louisiana.....	2,240	4,549	2,309	102.3
Total.....	10,833	20,620	9,787	90.4
Arkansas.....	2,375	4,473	2,098	88.3
Oklahoma.....	1,234	5,772	4,538	367.7
Texas.....	7,889	12,877	4,988	63.2
Total.....	11,498	23,122	11,624	101.1

The greatest rate of increase is shown by Oklahoma, due to the opening of that territory to settlement by white people. Virginia shows the lowest rate of increase, while West Virginia shows the second highest, the development of her mineral resources calling for extraordinary activity in railroad building. Tennessee and Louisiana have also made extraordinary progress. In the entire South the mileage increased 92.1 per cent., from 36,200 miles in 1887 to 69,556 miles in 1907. The

increase of 33,347 miles is about equal to the entire mileage of the country at the close of the Civil War.

What the construction of this new mileage meant in dollars and cents to the people of the South may be shown in a measure by a few simple calculations. At an average cost of \$30,000 to the mile, the amount they distributed in wages and in payment for right of way, material and so on equals \$1,000,000,000, an average of \$50,000,000 annually, or about \$1,000,000 a week. Allowing \$5000 a mile as a fair estimate of their yearly gross earnings, we have \$166,735,000, of which more than \$70,000,000 is paid yearly for labor and more than \$11,670,000 a year for fuel. The operation and maintenance of this new mileage gives steady employment at good wages to an army of 166,735 men, whose families would number fully 750,000 persons. Assuming that the land within 10 miles on each side of the 33,347 miles of new railroad has increased in value only to the extent of \$5 an acre, this enhanced value, due solely to the coming of the railroads, has added \$2,137,408,000 to the wealth of Southern landowners.

In step with this railroad development, the farms of the South have been rehabilitated, her rich mineral deposits opened, her forests tapped of their wealth; mills and factories have been put in operation, trade and commerce extended, the latest labor-saving and wealth-producing devices adopted. The manufactures of the South now exceed the agricultural products, and thus a complete change has been effected in the character of her industries. "The South has become rich, and only the surface of her wealth has been scratched," to quote the recent words of President-elect Taft. "Her growth has exceeded that of the rest of the country and she is now in every way sharing in its prosperity." The following statement will show something of her marvelous development within the past 30 years:

	1880.	1890.	1900.	1908.
Manufacturing capital.....	\$250,000,000	\$650,000,000	\$1,150,000,000	\$2,100,000,000
Value of manufactures.....	450,000,000	900,000,000	1,450,000,000	2,600,000,000
Farm products.....	600,000,000	770,000,000	1,270,000,000	2,300,000,000
Exports.....	260,000,000	305,000,000	484,000,000	648,000,000

The service rendered by the railroads in the development of the South is shown by the following statement. It covers the operations of the lines in what are known as the South Atlantic and the Gulf and Mississippi States. It is to be regretted that the statistics of the lines in Arkansas, Oklahoma and Texas are not available:

	1887.	1897.	Increase 10 years.	1907.	Increase 10 years.	Increase 20 years.
Miles road operated.....	20,253	31,392	11,139	39,969	8,577	19,716
Passengers carried.....	22,694,840	31,217,364	8,522,524	72,382,519	41,065,255	49,587,679
Carried one mile.....	\$34,934,326	1,174,471,887	339,537,561	2,814,645,707	1,640,173,823	1,979,711,382
Passenger earnings.....	\$22,528,740	\$27,215,364	\$4,686,624	\$68,722,984	\$41,507,620	\$46,194,244
Average mile rate.....	cents 2.70	cents 2.32	*cent 0.38	cents 2.84	cent 0.12	*cent 0.26
Tons freight moved.....	46,177,106	79,344,367	33,167,261	176,316,914	96,972,557	130,139,808
Tons moved one mile.....	4,873,081,569	11,061,842,659	6,188,761,090	29,001,560,546	17,940,107,887	24,128,868,977
Freight earnings.....	\$60,136,241	\$88,578,888	\$28,442,647	\$225,649,967	\$137,071,069	\$165,513,716
Average ton-mile rate.....	cents 1.23	cent 0.80	*cent 0.43	cent 0.78	cent 0.02	*cent 0.45

*Decrease.

The enormous increase in travel and in freight movement and the comparatively moderate increase in mileage operated show what an important factor the railroads are in the development of the country. Valuing the freight moved at \$30 per ton, which is probably too low an estimate, the increased tonnage represents an addition of \$3,904,194,240 in value of freight moved. And the reduction of 4½ miles in the rate per ton per mile represents a saving of more than \$130,000,000 per annum to shippers. The constantly increasing ratio of freight earnings to passenger earnings is a most favorable feature, as it indicates a very rapid development of the industries of the South.

Assuming a population of 20,000,000 in the two groups of States covered by the table, it may be said that in the year 1907 every Southerner traveled 291 miles and shipped one ton of freight 1450 miles over the railroads. His railroad trip was made in about 10 hours, costing him \$7, and his freight was delivered in about four days at a transportation cost of \$11.31, the entire cost of the service rendered by the railroad being \$18.31. Without using the railroads, he might have traveled his 291 miles on horseback or in a democrat wagon, the roads and weather being favorable, but it would have taken him two weeks to reach his destination and the cost would have been at least \$70. Similarly, he might have hired a truck and team to deliver his freight, but it would be on the job almost five months and he would have had to pay \$302.50 for the luxury. The entire cost by road would have been \$432.50, as against \$18.31 by railroad.

Another thing that will interest the average Southerner is the profit made by the bloated railroad owner on his investment. This amounts to less than \$1.20 a day per mile of railroad operated. In other words, on an investment of about \$20,000 he reaps the munificent return of say \$450 per annum, just 2¼ per cent. on his money; or, to put it in simpler form, he earns less than \$8.50 a week, an amount that the truck-driver or the driver of the democrat wagon would scorn to work for.

The future of the South is in the hands of her children. Her greatest needs are more and better railroads, and especially the capital, without which these cannot be obtained. To keep up with the march of progress, she should build in the next 10 years at least 40,000 miles of new line and increase her auxiliary trackage until its length is one-third as great as that of her main track. Additional or enlarged terminals must be provided; improved stations, warehouses and elevators erected; docks and wharves put in at water terminals; heavier engines, larger and better cars employed. In fine, the betterment of the old lines must at least keep pace with the construction of the new. All these necessary additions and improvements will cost no less than \$2,500,000,000, which must come from without the South. To secure such an amount of capital on any terms competition must be entered into with all the lines of human industry and endeavor throughout the world; and, as the railroad never has been regarded by investors as a perfectly safe investment, an extra return will be inevitably demanded on account of the risk. In the South in particular, where the railroads have been regarded almost as public enemies, the adoption of a policy of fairness and liberality toward them is of the first consequence. Capital is a mighty shy bird, which may be coaxed, but never can be forced.

It is pleasing to notice that in the Southern States a revulsion of feeling toward the railroads appears to be setting in, and it is earnestly hoped that it will meet with no check, but grow into a sentiment of friendliness for these great and beneficent instruments of progress. What the South may become, and must become, if she continue wisely to use her opportunities, may be readily understood if we compare her present stage of progress with that attained by sections of the country not more richly endowed by Nature with wealth-producing capabilities, but in which the con-

struction of railroads has been invariably encouraged. Take the States of Massachusetts, Pennsylvania, Ohio and Iowa as examples. The combined area of those States is 150,579 square miles, their population 16,862,000 and their railroad mileage 32,596; that is to say, for every 100 square miles of territory they have 11,200 persons and 22 miles of railroad. Or, in other words, for every 10,000 persons they have 89 square miles of territory and 19 miles of railroad. Their combined wealth is \$26,500,000,000, equal to \$1570 per capita. The area of the entire South, including Arkansas, Oklahoma and Texas, is 887,442 square miles, the population 26,600,000 and the railroad mileage 69,556; the average per 100 square miles of territory being less than 8 miles of railroad and less than 3000 persons, and the average per 10,000 of the population about 334 square miles of territory and about 25 miles of railroad. The combined wealth of these States is less than \$15,500,000,000, or about \$570 per capita. With the same ratio of railroad mileage and population to territory and of wealth of population as obtains in the four Northern States, the South would have more than 99,000,000 persons, whose wants would be served by 192,000 miles of railroad and whose combined wealth would amount to \$155,430,000,000. These figures are stupendous, but the construction of railroads has wrought greater wonders than would be their realization in a place as favored by Nature as is the South.

Southern Resources as Related to Two Railroads.

By CHARLES E. HELLIER, of Boston.
[Written for the Manufacturers' Record.]

Mr. Charles E. Hellier is a leading attorney-at-law of Boston. As president of the Big Sandy Company, owning 130,000 acres of coal lands in Eastern Kentucky, Mr. Hellier has been a leading factor in bringing about the development of that section. He is a great believer in the South, and a great worker in its upbuilding.

Railroads are the pioneers of commercial and industrial developments.

Of great importance to the South will be the completion of the two railroads above mentioned. The first runs almost due north and south; the second nearly east and west. They both connect with the Atlantic seaboard that part of the Appalachian coal fields which lies where Virginia, West Virginia and Kentucky meet, but they run at right angles to each other. One connects Charleston, S. C., and Savannah with the coal fields; the other gives a third route from Chesapeake Bay to the coal fields. One is the fulfillment of dreams, plans and endeavors of many men for many years. The other was probably not conceived by the mind of man 10 years ago and is the creation of one master mind that built and owns it. The Carolina, Clinchfield & Ohio Railroad runs from Elkhorn City, Ky., at the Virginia line, across the western part of Virginia, the eastern part of Tennessee and Western North Carolina to Bostic, where it connects with the Seaboard Air Line system, which includes a line to Wilmington, N. C., then on to Spartanburg, S. C., where direct connections are made with Charleston, Savannah and Florida. This line passes through the Breaks of Sandy, a natural gap in the Cumberland Mountains, which has attracted the attention of railroad builders for more than 50 years. Many have attempted to build this road and spent life and fortune without accomplishing the desired result.

But it remained for the genius and energy of George L. Carter to finally marshal the men and the money necessary to link the coal fields of the Virginias with the cotton mills and cotton fields of the Carolinas. Mr. Carter early in his career appreciated the value of the stores of coal and iron in his native hills. He gradually developed coal mines, iron mines and iron furnaces as he was able to raise the necessary capital. For some years the greater part of his energies was expended in the quest for money to carry out his various business propositions. After eight years of hard work he brought together his mines and furnaces in the well-known company now successfully operating under the name of the Virginia Iron, Coal & Coke Co. Leaving the presidency of this company some five years ago, he addressed himself to the task of acquiring the Dickenson county (Virginia) coal fields, to which he has given the name "Clinchfield," from the Clinch River, that bounds it, and connecting it with the several Southern railway systems in the Piedmont section of the South by a railroad from Elkhorn City, Ky., at the Breaks of Sandy, across the several mountain ranges known as the Cumberland, the Sandy Ridge and the Blue Ridge Mountains. This line, less than 300 miles in length, will probably cost more than \$30,000,000.

It means much to the South to have men of sufficient caliber, courage and financial ability to spend \$30,000,000 in this enterprise, brought in close contact with the resources of the South through financial interest in their investment in this railroad.

It means more to the South to have a new trunk line, which the building of this road assures to the Carolinas, Georgia and Florida, from the prosperous territory lying between Buffalo and Chicago and the Ohio River.

A glance at a map of the United States east of the Mississippi will demonstrate that a railroad from Ashland, Ky., on the Ohio River, to Spartanburg, S. C., is the most direct line from the Middle West to the South. Along this line commerce will flow as naturally as a river in its bed.

The facile transport of people and merchandise is a large factor in creating commerce, and this railroad will build up a great commerce of its own.

Another result of this new trunk line will be to bring into the currents of modern life and civilization several hundred thousand persons who are now shut off in the valleys of the Southern Mountains by lack of transportation facilities and who will be made a live and important asset of the nation. It will develop great coal fields, perhaps the richest in the United States, which will in turn support many mining towns and cities that will become consumers of merchandise of all kinds. It will increase the value of these coal fields by tens of millions of dollars.

The coal territory through which this trunk line runs aggregates about a million acres of coal areas, which, judging from the values railroad developments have created in other fields and the rapidly diminishing supply, will be easily worth a hundred million dollars in 10 years.

The coals in this territory comprise nearly all kinds of bituminous coals in thick veins of easy access. In the northern part of the coal fields are the cannel and splint coals. These splints are clear and free from slate, hard in texture, and are valuable steam and domestic fuels that will compete on even terms with the best splints of the Kanawha and Guyandotte valleys. Farther to the south is found the Great Elkhorn

field of coking coal, probably the largest and most valuable field of coking coal in the United States by reason of the chemical purity of the coal, its existence in enormous quantities and the facility and economy with which it can be mined and transported to market. Mr. J. V. Thompson, the eminent coking coal land owner and banker of Uniontown, Pa., in a recent article referring to this field, said:

"The policy of some railroads has been to develop territory only as they are compelled to. A good example of far-sightedness is the policy adopted by President Stevens of the Chesapeake & Ohio Railroad three or four years ago, when he decided to build several branch lines into new territory. The Big Sandy Division going into the Elkhorn field, over 100 miles in length, taps a field that will give it large tonnages for years to come, and this was at a time when the operators on the main line stated that they were getting only about a half of a car supply; but at the present time, with half of the operations worked out on the main line, they are assured of a future tonnage because of the wise policy adopted of opening up new territory and providing for future needs. It means an assured dividend to the stockholders of the Chesapeake & Ohio Railroad for future years."

The superior qualities of the Elkhorn coal are now admitted. The purity of the coal is such that sulphur not to exceed seven-tenths of one per cent. (.7) and ash not to exceed six per cent. (.6) can be guaranteed over a large part of the field, while the B. T. U. will exceed 14,000. Such coal as this needs only to become known in order to be in great and increasing demand. When it is realized that this railroad will develop 5,000,000,000 tons of commercial coal in Southwestern Virginia and Eastern Kentucky, it is clear that an event of national importance is taking place, as well as an epochal event in the history of bituminous mining development.

This new line will strengthen the manufacturing interests of the South by furnishing an ample fuel supply of high grade and low cost, which will in turn, by creating new wealth, raise the standard of living in the South and create new markets for manufactured goods. It will take to market the virgin forests of the heart of America, which will be turned into money that will seek investment in new developments in the South.

A great tide of travel will be attracted by the grand and noble mountain scenery along this line and by the service made possible by the superior construction of this road, which is certain to be the popular route from the Middle West to the winter resorts of Florida and Cuba, and among those travelers will be some who will see and appreciate the resources of the great coal and timber fields traversed, as well as the many opportunities for investment in the South country.

All of these things were appreciated and were well presented in the money markets of London, New York, Philadelphia and Boston by the unsuccessful predecessors of George L. Carter. There are old document boxes and dusty files in offices in these cities in which are prospectuses and reports setting forth all the advantages the building of this line would bring to the South, and incidentally to the investors in the bonds which should furnish the necessary funds. Many millions were raised and spent and were lost to the owners, though donated to the South, because enough more were not furnished to complete the enterprise, and perhaps also because the early investors were ahead of the times.

But there can be no question but what this road is now needed and that as soon as the final connection is made at Elkhorn City traffic will begin to flow over it in ever-increasing volume, coal and timber to the South and North, and an interchange of merchandise between the two great and prosperous sections it connects.

The Chesapeake & Ohio Railway, through its efficient and far-sighted management, has taken time by the forelock and has already extended its line from Ashland, Ky., on the Ohio River, to Elkhorn City, so that when the last spike is driven in the Clinchfield, Carolina & Ohio the dream of the promoters of the Charleston, Cincinnati & Ohio Railway of a trunk line from the Ohio River south to the sea will at last have become a reality.

It will then remain for the citizens of the South to recognize, treat fairly and profit by the new and splendid highway which the hard work of George L. Carter and his many predecessors has brought to pass. But it is human nature to recognize and take advantage of what will be of personal benefit, and the people of the South will be fully alive to the great value to them of the new trunk line to the Middle West, and will add thereby to the value of their material resources tenfold and more the cost of this new road.

The other road—the Virginian—built and owned by Mr. H. H. Rogers, is an entirely different, but not less interesting, proposition. There were already two lines of rails connecting the coal fields tapped by the Virginian with the sea before the Virginian was built—the Chesapeake & Ohio and the Norfolk & Western Railroad. The Virginian is in a territory which seemed already fairly well occupied, but it is in able and experienced hands and it commands financial resources sufficient to accomplish great results. It will open up to manufacturing and commerce the country through which it runs, but its greatest service to the South will be in finding new and worldwide markets for Southern coal in order to secure traffic for its support and development, and thereby it will stimulate activity in and increase the value of the coal territory it serves.

It also at some time will become part of an East and West trunk line, and it will further develop Chesapeake Bay as a port of both domestic and foreign commerce.

The Virginian Railroad, perhaps, was hardly needed by the South as much as the Carolina, Clinchfield & Ohio, but, it having been built, it will do its work and bring in new men, new capital and new facilities to develop those resources of the South which are within its reach.

The South owes a debt of gratitude to the men who have built these two important highways of commerce in its territory; to George L. Carter and his associates, the members of the firm of Blair & Company, Thomas F. Ryan, the Marshall Field estate, T. Jefferson Coolidge, Jr., and Norman B. Ream, builders and owners of the Carolina, Clinchfield & Ohio Railroad; to H. H. Rogers, builder and owner of the Virginian Railroad, and his able lieutenants, G. M. Hyams and Major Page, and also to George W. Stevens and Decatur Axtell, the president and vice-president of the Chesapeake & Ohio Railroad. For on their initiative and under their able and efficient management the Big Sandy division of the Chesapeake & Ohio Railroad has been extended from the Ohio River south to Elkhorn City, where the Carolina, Clinchfield & Ohio Railroad will meet it and complete the trunk line from the Ohio River to the South.

This debt the citizens of the South can best repay, and with great profit to themselves, by showing equal courage, energy and capacity for honest hard work in develop-

ing the resources with which they are endowed and thereby furnish these new railroads with freight and passenger traffic.

The interests of these railroads and of the people they will serve are mutual and interdependent. The coal remains in the hills, the timber rots on the stump and the soil returns only a living and no cash return or profit to its owners until the railroads give them access to markets. Such access now being assured to the resources within economic reach of these railroads, it only remains for the owners of these resources to seize the opportunities now opened up and at hand, and by so doing to add to the wealth of themselves and the nation, as have the citizens of other sections of the country where similar transportation facilities have been enjoyed.

The Coal Resources of the Southern States.

By EDWARD W. PARKER.

[Written for the Manufacturers' Record.]

Dr. Edward Wheeler Parker, statistician of the United States Geological Survey, is the author of the reports of the survey in different years on coal and coke in the United States. He was connected as an expert with the Twelfth Census.

The area included in what is designated in this paper as "the Southern States" embraces all of those south of the Ohio River and the States of Missouri, Arkansas, Louisiana, Oklahoma (Indian Territory) and Texas west of the great waterway. Twelve of these States have produced coal, 11 contributed to the output in 1907, and four are non-producers. These Southern States produced in 1907, according to statistics compiled by the United States Geological Survey, a total of 101,870,429 short tons, having a value at the mines of \$119,305,513. This output was a little over half the coal production of the entire United States in 1897, only 10 years before; it was nearly 80 per cent. of our total production in 1887, and was more than 1.6 times that of 1877. It was nearly equal to the combined production of Austria-Hungary, France and Belgium, which rank, respectively, as the third, fourth and fifth among the coal-producing countries of the world, and one of the Southern States, West Virginia, produced more coal in 1907 than any other country of the world, except Great Britain and Germany. The value of the coal product of the Southern States in 1907 at the mines (\$119,305,513), was equal to one-third of that of the entire mineral production of the United States in 1880. The aggregate coal production in the Southern States from the beginning of the industry (the earliest date of record is 1820, when Maryland produced 3000 short tons; the second, 1828, when Kentucky is credited with 328 tons of coal production) has amounted approximately to 1,194,000,000 short tons, and if we can assume that for every ton of coal mined or shipped one-half a ton is wasted or lost, the exhaustion represented by this production has amounted to 1,791,000,000 short tons.

In the Southern States, as in other parts of the country, the development of the coal-mining industry has been literally by leaps and bounds, and every decade has seen the production more than doubled. In fact, the rate of increase in the Southern States has been considerably more than that of the other coal-producing sections. In 1860 the coal production of the Southern States was 1,654,720 tons; in 1870 it had more than doubled to 3,453,435 tons; in 1880 it more than doubled again to 7,002,254 tons; in 1890 it more than trebled to nearly 25,000,000 tons; more than doubled again in 1900 to 54,510,469 tons, and almost doubled again in 1907, with three years yet of the decade to be completed. In these same years the total coal production of the United States (including the Southern States) has shown the following gains: 1870 was 2.26 times that of 1860; 1880, 2.16 times that of 1870; 1890, 2.21 times that of 1880; 1900, 1.71 times that of 1890, and 1907, 1.78 times that of 1900. This is somewhat more strikingly shown in the increase of the per capita production. In 1860 the per capita production of coal in the Southern States was 0.14 ton; in 1870 it was 0.25 ton; in 1880 it was 0.38 ton; in 1890, 1.12 tons; in 1900, 1.99 tons, and in 1907, 3.31 tons. In the same years the per capita production of coal for the whole United States was: 1860, 0.514 ton; 1870, 0.96 ton; 1880, 1.52 tons; in 1890, 2.52 tons; in 1900, 3.53 tons, and in 1907, 5.6 tons. From these figures it appears that the per capita production of the coal for the entire United States in 1907 was 11 times that of 1860, the per capita production in the Southern States had increased more than 22 times, or at a rate double that of the country as a whole.

The statistics presented in the foregoing paragraphs indicate to what an extent the coal-mining industry of the Southern States has been developed. A more important and doubtless more interesting subject is, however, not that of the past production, but that of the resources upon which the future development must depend. The work of the National Conservation Commission has, so far as the mining industry is concerned, been greatly facilitated by work already done by the United States Geological Survey,

amounted to nearly 500,000 square miles, and that the original contents of coal when mining began were something over 3,100,000,000,000 short tons, of which about 2,000,000,000,000 tons are easily accessible, the remainder, on account of great depth or other adverse conditions, being considered as accessible with difficulty. Of the easily accessible coal, however, not more than 75 per cent., or possibly 1,500,000,000,000 tons, can be considered as available under present mining and market conditions, or the conditions which are apt to obtain in the immediate future. The production to the close of 1907 (one year later than that shown on Mr. Campbell's map) has amounted to a little over 6,865,000,000 tons, which, at an average of one ton lost for every two tons mined and marketed, represents an exhaustion of 10,200,000,000 tons. During the last 50 years the production has increased at the average rate of 7.36 per cent., which means that the output has about doubled every 10 years.

The known coal areas of the Southern States embrace a total of 165,166 square miles, of which the original contents, according to Mr. Campbell, as previously stated, were 532,438,000,000 short tons. Of this amount of coal, probably not more than 300,000,000,000 short tons can be considered as available under existing conditions, and from it nearly 1,800,000,000 tons, including loss and waste, have already been extracted. This exhaustion is equivalent to 0.6 per cent. of the original supply which is immediately available. The production of the Southern States in 1907 (101,870,429 short tons) represented an exhaustion of, say, 153,000,000 short tons, or 0.05 per cent. of the supply. It would appear from these figures (and approximately the same relations of supply and production obtain throughout the entire United States) that we have not as yet made any serious inroads upon our reserves, but if the enormous rate of increase shown in the past 50 years (7.36 per cent. annually) continues, our children's grandchildren will be more concerned about the total exhaustion of the coal supply than we are now about the store of anthracite and of Connellsville coking coal, the complete exhaustion of the latter being now placed at from 35 to 40 years. At the increasing rate of production shown during the last half-century, the production of coal 25 years hence would in a single year be equal to one-half of the aggregate output from the earliest times to the close of 1907, and in another quarter-century the annual production would be at least three times that quantity and 1.70 of the original supply. It is difficult to believe, however, that such a rate of increase will continue indefinitely, but what course the curve of future production will take it is impossible to say. The only known factors in the solution of such a problem are the estimates of supply and the statistics of production. Powerful influences, such as improved methods in the mining and utilization of coal and the substitution of other sources of power, should tend to the extension of the life of the coal supplies. We all know that production will not continue to increase until the supply is practically exhausted, and then suddenly cease. The curve of future production may be expected to show for a while a decreasing ratio in the percentage of increase, then a period of approximately constant output, and then a period of decline. Upon these anyone who wishes may predicate any guess or any "estimate" to which his prophetic soul lays hold. The writer has seen so many interpretations and misinterpretations of what he has stated might happen under certain conditions that he has retired from the field of prophecy.

As having an important bearing upon the prolongation of the coal supply for the use of generations yet to come, the writer believes it wise to discourage the tendency in some quarters to seek an outlet for our present "surplus" coal in foreign markets. The nation which exports its raw products is, if not approaching decadence, certainly not keeping step with modern progress in industrial development. England has awakened to the fact that in the building up of an enormous export trade in coal she has impoverished her future, and we should not let our present wealth lead us into the same prodigal error. Let us utilize our raw materials in the building up of manufacturing communities, and depend for our "balance of trade" upon the export of our manufactured products.

What is true in this regard of the nation as a whole is true also, though possibly in less degree, of the South. The utilization of the coal, the iron ores, and the other mineral products within the South makes for the greater prosperity and the higher development of their citizenship. West Virginia, richest in its resources of coal among the Southern States—first among them, and third among all the States in coal production—is singularly unfortunate in not having generous supplies of iron ore at hand, and in not having developed its coal field until Pittsburg and other iron-manufacturing districts had been long established. As a result, nearly all of the coal and coke produced in that State (outside of a comparatively small amount consumed in the Wheeling district and in Charleston and vicinity, and that used by railroads and for household purposes), some of it the highest grade of bituminous and semi-bituminous coal produced in the United States, is shipped out of West Virginia to supply manufacturing industries in other States. West Virginia in 1907 produced 48,091,583 short tons of coal and 4,021,794 tons of coke, but made only 291,000 long tons of pig iron. Alabama, on the

Coal Resources of the Southern States.

Original Supply, Decennial Production and Total Output (Including Waste) of Coal in the Southern States—Short Tons.

	Estimated original coal supply.	Percentage available under present conditions.	1860 production.	1870 production.	1880 production.	1890 production.	1900 production.	1907 production.	Total to January 1, 1908, including waste.
Alabama.....	68,903,000,000	50	10,200	11,000	333,972	4,090,409	8,394,275	14,250,454	247,000,000
Arkansas.....	1,887,000,000	75	200	200	14,778	390,888	1,447,945	2,670,438	36,000,000
Georgia.....	933,000,000	100	1,900	15,000	154,644	228,337	315,557	362,401	12,000,000
Kentucky.....	104,028,000,000	50	285,780	150,582	946,288	2,701,496	5,328,864	10,753,124	184,000,000
Maryland.....	8,044,000,000	90	438,000	1,819,824	2,228,917	3,357,813	4,024,688	5,532,028	221,000,000
Missouri.....	40,000,000,000	25	280,000	621,580	844,304	2,735,221	3,540,103	3,397,586	146,000,000
North Carolina.....	300,000,000	...	...	15,000	250	10,262	17,734	...	1,000,000
Oklahoma.....	75,278,000,000	50	...	...	120,947	869,229	1,922,298	3,642,658	60,000,000
Tennessee.....	25,665,000,000	60	165,300	133,418	496,131	2,169,585	3,509,562	6,810,243	126,000,000
Texas.....	31,000,000,000	50	...	...	...	184,440	968,373	1,648,069	22,000,000
Virginia.....	22,500,000,000	70	473,390	61,803	43,079	784,011	2,393,754	4,710,895	86,000,000
West Virginia.....	150,000,000,000	70	...	608,578	1,829,844	7,394,654	22,647,207	48,091,583	650,000,000
Total.....	532,438,000,000	58	1,654,720	3,437,485	7,002,254	24,925,845	54,510,469	101,870,429	1,791,000,000
Population.....			12,203,157	13,884,300	18,538,340	22,341,504	27,445,457	30,738,912	
Production per capita.....			0.14	0.25	0.38	1.12	1.99	3.31	

*Estimated.

although there is much work of a quantitative character in the determination of our mineral resources still to be accomplished.

In the "stock-taking" of our mineral resources the study of our coal fields, which has been the special work of Mr. M. R. Campbell, geologist in charge of the economic geology of coal, and his assistants for the last three or four years, has proved of inestimable value. In May, 1908, the Geological Survey published a map showing the known coal fields of the United States, with estimates of the areas in square miles, the original contents of the coal beds, and the production and exhaustion to the close of 1906. These estimates showed that the total areas of the coal fields of the United States

other hand, with less than one-third of West Virginia's production of coal (14,250,454 short tons in 1907), and with a coke production in the same year of 3,021,794 tons, produced 1,886,674 tons of pig-iron. Alabama has 49 blast furnaces; West Virginia, four.

As previously stated, West Virginia has the largest reserve of coal of any of the Southern States. The latest estimates of the supply, made by Mr. M. R. Campbell of the United States Geological Survey and Dr. I. C. White of the West Virginia Geological Survey, place the original content of coal in West Virginia at 150,000,000,000 tons, probably 70 per cent. of which is available under present mining and market conditions. The total exhaustion, including loss and waste, at the close of 1907 was

650,000,000 tons, leaving as still available 104,350,000,000 tons, of which 70,000,000,000 tons might be considered as recoverable.

Kentucky comes second among the Southern States in the quantity of coal stored in its hills, with 104,028,000,000 short tons, of which 50 per cent., or say, 52,000,000,000 tons, may be considered as at present available. Kentucky's production in 1907 amounted to 10,753,124 short tons, and the exhaustion to January 1, 1908, is estimated at 184,000,000 tons.

The third State in its coal resources is the youngest in the sisterhood of States, Oklahoma, the original supply being estimated at 70,278,000,000 tons, with 50 per cent., or 39,600,000,000 tons, as at present available. From this supply there had been exhausted at the close of 1907 60,000,000,000 tons. Oklahoma's production in 1907 was 3,642,658 short tons.

Alabama, the second in production, is fourth in available supply, the fields of that State being estimated to have contained when mining began a store of 68,903,000,000 tons, or 58 per cent. (say, 34,500,000,000 tons) available under existing conditions. Alabama produced in 1907 14,250,454 short tons, and the total production, including waste, has amounted to 247,000,000,000 tons.

In the accompanying table is presented a statement showing the estimated original coal supply of all the Southern States; the percentage considered as at present available; the production during a series of decades and in 1907, and the exhaustion to January 1, 1908. To this is appended a statement covering the population of the Southern States in the years for which the production of coal is given, and the production per head of population.

OIL AND GAS IN OKLAHOMA.

By CHARLES N. GOULD, Director of the Oklahoma Geological Survey.

[Written for the Manufacturers' Record.]

Prof. Charles N. Gould has the good fortune to be at the head of the State Geological Survey of the youngest State in the Union, a State whose mineral riches have only begun to be developed. The work already done by the Survey is attracting wide attention in the country.

The Oklahoma oil field as already developed is scattered over an area of 6000 square miles, located in the northeastern part of the State. Its eastern and southern limits may be quite sharply defined. The eastern limit is not far from the Grand River, and the southern limit will not extend beyond the Choctaw fault, which runs from the Arkansas line west and southwest as far as Atoka. The western limit of the future field is more difficult to determine, but will probably lie not far from the western line of the old Creek Nation.

The first drilling in the Mid-Continent field, of which the Oklahoma field forms a part, was done in Kansas a number of years ago. Both oil and gas having been found in quantities just north of the Oklahoma line, several drillers ventured southward into what was at that time Indian Territory. The first wells were drilled near Chelsea and Bartlesville. With this small beginning the development spread south and east until at the present time it has in a few instances reached the Canadian River. There is little doubt that future drilling will show the presence of oil as far south as McAlester or even Coalgate, and it seems quite certain that the Oklahoma field will connect up with the Arkansas gas fields near Fort Smith and Manford.

The greater part of the oil and gas so far found in Oklahoma occurs in six general regions, namely, the Muskogee field, in and near the city of Muskogee; the Ninety-sixth Meridian field, which extends from the north line of the State to the Glenn pool; the Coody's Bluff-Alluwe field, usually known as the Shallow field, in Nowata and Rogers counties; the Cleveland field, in a bend of the Arkansas River, in Eastern Pawnee county; the Hogshooter field, along Hogshooter Creek, in Eastern Washington county, and the Bald Hill-Morris field, east and northeast of Okmulgee.

The first development in the Muskogee field was in 1894, when two wells were drilled within the present city limits. In 1904 some 30 new wells were brought in, with a total production of 1000 barrels per day. However, it was not until the winter of 1906-1907 that anything like extensive operations were carried on. At that time a strong well of high-grade oil was brought in a few miles southwest of the town. Since then more than 100 producing wells have been drilled, and new wells are constantly being brought in.

Probably more than two-thirds of all the oil produced in the State has been found along the line of the Ninety-sixth Meridian, which was the dividing line between the Cherokee and Osage nations. Wells drilled a few miles east or west of this meridian have almost invariably found large quantities of oil or gas. In Kansas the wells at Caney and Peru are located near this line. The most prominent fields along the Ninety-sixth Meridian are those near Copan, Bartlesville, Dewey, Skiatook, Tulsa, Redfork and the now famous Glenn pool. In 1901 there were five producing wells just beyond the Osage reservation line west of Bartlesville. In 1902 oil and gas were discovered at Redfork south of Tulsa. Since 1906 there has been a row of wells down the meridian line from the Kansas line to Beggs.

The first producing wells of the Coody's Bluff-Alluwe field were brought in a few miles west of Chelsea eight years ago. The producing area in this region lay to the northward, and at the present time the field covers a region six to ten miles wide and about 25 miles long. The depth to oil sand in this field is variable, ranging from 150 feet in some places west of Chelsea to nearly 600 feet at the northern end.

Another productive region is at Cleveland, some 25 miles west of the Ninety-sixth Meridian. This field is small, occupying not more than half a dozen sections, but it has produced a large amount of oil. However, it seems to have passed its prime, for a number of once good producing wells have quit flowing. Judging from geological conditions, it is believed that a new and larger field will be discovered southwest of the old one at Cleveland.

In Eastern Washington county, along Hogshooter Creek, some splendid flows of gas have been encountered. In 1907 a well said to produce 60,000,000 cubic feet per day was brought in.

In 1906 a well was brought in about six miles east of Okmulgee. This was followed by others, until at the present time there are more than 50 wells producing

either oil or gas in paying quantities. This region has developed into what is known as the Bald Hill-Morris field, and is destined to become a prolific field.

Besides the areas mentioned, there are a number of localities where small quantities of oil and gas have been found. Successful wells have been drilled at various places in Osage county west of the Ninety-sixth Meridian. At Wheeler, about 20 miles north-west of Ardmore, in the southern part of the State, a number of wells producing heavy fuel oil in paying quantities have been brought in. Both oil and gas in small quantities have been found at Gotebo and Lawton, near the Wichita Mountains, and a small quantity has been found at Granite, at the western extremity of the same range. Dry gas sufficient for local use is found at Blackwell, Ponca City, Coweta, Chelsea and Bristow. Coweta also produces some oil, and light producing wells have been brought in near Wewoka, Madill and Manford.

The depth to the oil sand varies in different localities. In the Coody's Bluff-Alluwe field east of the Verdigris River the average depth is about 600 feet. Farther west, near Bartlesville, wells are 1000 to 1200 feet deep. Near Tulsa, and in the Glenn pool, the greater part of the oil and gas is found at a depth of 1500 to 1700 feet. At Cleveland the oil is found in a higher sand than at Bartlesville or Tulsa, but the depth is approximately the same as in these localities.

In 1907 Oklahoma ranked first in production of oil among the States of the Union, 44,300,149 barrels, worth \$17,750,000, having been produced in that year.

The oil in this region is found in rocks of Carboniferous age. In the Kansas fields it occurs in the Cherokee shales, a formation 450 feet thick, which lie at the base of the coal measures, and just above a heavy limestone of Mississippian age known as the Boone chert. This rock is known to the driller as the Mississippi lime, and as far as known neither oil nor gas in quantity has been found beneath it. Farther south in Oklahoma the Cherokee shales thicken, but here also the oil and gas are found in this same general horizon.

There is no connection whatever between the oil and gas in the Mid-Continent field and that found at Corsicana and Beaumont, Texas. The Corsicana oil comes from the Upper Cretaceous rocks, and the Beaumont is from the Tertiary deposits, still younger formations. The only oil in the central part of the United States which is of the same age as that in the Mid-Continent field is found at Henryetta, Texas, where the deposits are found at about the same level as in the Mid-Continent field.

In the light of present knowledge it seems probable that the Oklahoma gas field is the most extensive so far discovered in the United States. There is absolutely no way of estimating the amount of gas so far discovered in the field. Gas has been found in practically all the oil fields above mentioned. In many cases wells produce anywhere from 10,000,000 to 20,000,000 cubic feet per day, and a number of wells are reported to yield all the way to 50,000,000 and 60,000,000 cubic feet.

There has been very little market for gas, and perhaps not 10 per cent. of the region known to be productive has been drilled, and certainly not 10 per cent. of the future productive regions have yet been prospected. So that at a conservative estimate not 1 per cent. of the available gas has been touched.

There is not a city or hamlet in the oil region that does not have gas within a few miles ample for all needs. In a number of instances gas is sold for manufacturing purposes at two cents and three cents per thousand cubic feet, and the conditions of the field justify the prediction that the price need not be advanced for many years to come.

The Oklahoma Natural Gas Co. is now delivering gas to Oklahoma City, 100 miles from the field, and to points between that city and the field, at 25 cents per thousand cubic feet for domestic use. The company is preparing to extend their lines to Chickasha, Lawton, El Reno, Kingfisher, Enid, Perry, Pawnee, Stillwater, Guthrie and intermediate points. This company claims to control a supply sufficient to last 10 years.

Most of the oil and gas is sold to the Prairie Oil & Gas Co., a subsidiary of the Standard Oil Co., and the Gulf and Texas companies, only a small per cent. going to independent companies. During the year 1907 two pipe lines were completed from the Gulf Coast to the Glenn pool, in the southern end of the Ninety-sixth Meridian field, and a number of large storage tanks were erected. One line leads northeast to the Atlantic Coast. The completion of these lines gave considerable relief to market conditions, but transportation facilities have not kept pace with increased production.

It is believed by those who have been over the field carefully that the Oklahoma oil field is only in its infancy, and that it will continue for many years to be the most prolific field in the United States.

In addition to the vast amount of oil and gas, Eastern Oklahoma contains anywhere from 6,000,000,000 to 10,000,000,000 tons of a high-grade bituminous coal. Much of it is good coking coal. Thus it will be seen that the fuel problem is solved for Oklahoma.

Raw material for a great variety of products is found in abundance in the oil and gas fields. Clay of various kinds for the manufacture of brick, tile, hollow-ware, terracotta, pottery and fire-clay is abundant throughout the region. Limestone suitable for burning into lime or for the manufacture of Portland cement is widely distributed. Glass sand is abundant at no great distance. The lead and zinc fields are near at hand, and the largest gypsum deposits in the United States are not far away. There is an abundance of hardwood timber and plenty of building stone. All of these raw materials, combined with the inexhaustible deposits of all kinds of fuel, render this an attractive region for permanent investment.

THE DELAY IN SOUTHERN IRON DEVELOPMENT.

By EDWIN C. ECKEL of Washington, D. C.

[Written for the Manufacturers' Record.]

Mr. Edwin C. Eckel, who for the past two years has been a consulting engineer and geologist, with headquarters at Washington, was for several years connected with the United States Geological Survey, latterly as geologist in charge of the section of iron ores and structural materials.

In comparing conditions in the Southern iron industry of today with those existing 20 or 30 years ago, when active development of Southern iron resources first began to be noticeable, the most striking feature is, not the extent of this development, but its slowness and its comparative unimportance. Contrary to a very general impression, the Southern iron industry has grown very slowly, while that of other American iron districts has developed rapidly during the last decade. The truth of this view of the matter is evidenced when the pig-iron production of the various sections is tabulated

for a series of years. The relative importance of the Southern iron industry as compared with that of the entire United States is shown in the following table:

Year.	Production of United States.	Production of Southern States.	Percentage of total, Southern States.
1854.....	724,833	86,949	11.99
1880.....	4,295,414	265,526	6.18
1885.....	4,529,869	626,523	13.83
1890.....	10,307,028	1,642,930	15.94
1891.....	8,279,870	1,499,284	18.01
1892.....	9,157,000	1,636,243	17.87
1893.....	7,124,502	1,333,935	18.72
1894.....	6,657,388	1,182,044	17.75
1895.....	9,446,308	1,549,204	16.40
1896.....	8,629,127	1,646,410	19.09
1897.....	9,652,680	1,586,737	16.44
1898.....	11,773,934	1,700,053	14.44
1899.....	13,620,703	1,938,219	14.23
1900.....	13,789,242	2,147,840	15.58
1901.....	15,878,351	2,109,081	13.28
1902.....	17,821,307	2,548,340	14.30
1903.....	18,009,252	2,713,496	15.07
1904.....	16,447,033	2,178,927	13.21
1905.....	22,932,380	2,589,399	11.29
1906.....	25,307,191	2,742,414	10.97
*1907.....	13,478,044	1,421,240	10.54

*First half of year.

While the South produced in 1854 almost exactly 12 per cent. of the American total, in 1880 her production had fallen to barely over 6 per cent. From this year on a relatively rapid increase in Southern output carried the percentage to 18 in 1891, to 18.72 in 1893, and finally to a maximum of 19.09 per cent. in 1896. Since 1896, though the Southern output has increased quite regularly, the increase is small compared with that shown by other sections. The result is that the Southern output is steadily becoming of less relative importance, the percentage having fallen off until during the first half of 1907 it was barely over 10.5 per cent.—considerably less than in 1854.

In view of these facts, it is evident that opinions currently held in the South as to the present relative importance of the Southern iron industry are hardly justified, and that in place of premature congratulation, it would be more profitable to study the causes of this slow development, and see which of these causes can be avoided in the future.

The fixed factors in the matter, which cannot be altered much by human effort, are the ores, the fuels and the labor supply. Taking up the latter first, it can be said that it is at present fairly abundant, but only fairly good, so that the labor costs per ton of product are today greater at Birmingham than at Pittsburg. This must be accepted as one drawback to the Southern industry. As for fuels, Southern coals vary widely in quality, from the very excellent New River product of West Virginia down to the merely passable coals used at some Alabama furnaces. Unfortunately, the poorer coals are found in the more important iron-producing districts.

With regard to ores the case is different, for there are many good and cheaply extractable ore bodies widely distributed throughout the South. The status of the South at present in this line is indicated in the following table:

	1905.		1906.		1907.	
	Quantity, in long tons.	Percentage of total.	Quantity, in long tons.	Percentage of total.	Quantity, in long tons.	Percentage of total.
Lake Superior.....	33,490,267	78.73	38,035,084	79.66	41,638,744	80.51
Southern.....	5,700,819	13.41	6,335,710	13.24	6,427,195	12.42
Northern.....	2,520,845	5.93	2,582,666	5.41	2,823,422	5.46
Western.....	824,102	1.93	806,268	1.69	821,258	1.61
Total.....	42,536,133	100.00	47,749,728	100.00	51,720,619	100.00

Preliminary statements regarding the work of the Conservation Commission seem to indicate that the South is credited with possessing about one-quarter of the available iron-ore reserves of the United States, or something less than 1,000,000,000 tons. Since several Southern iron companies believe that their own holdings amount almost to that total, the estimate can be regarded as conservative enough. Of course, the circumstances connected with the creation of the commission practically committed it in advance to taking a pessimistic view of all our resources, and it is improbable that its findings will cause serious alarm to those directly connected with the American iron industry. Though ore grades may fall off while ore prices rise, neither of these effects is likely to force very important readjustments in the industry for many years to come.

What we may fairly expect, however, is that in the near future there will be a relatively more rapid development among two classes of iron plants—those located at Southern interior points and using Southern ores, and those located at points on the central and South Atlantic Coast and using West Indian and South American ores. Plants of both of these types will possess ample supplies of cheap ores and fuels, while the coastal plants in particular will have peculiarly favorable locations as regards distributing and marketing their products.

With this probable expansion in the Southern iron industry in prospect, it would seem desirable, from several distinct points of view, that at least some of the development should be of local origin. At present there is hardly a large iron company operating in the South which is controlled by Southern owners, and local capital has been very difficult to secure for even small iron developments. The immediate result of this is, of course, that the profits of Southern ironmaking do not increase the stock of local capital. A more serious effect is that the Southern iron industry is thus deprived of a local support which would be very useful to the industry at times of political, financial or industrial agitation and unrest.

With regard to seaboard iron development, local interests can have but little to do, for such developments will be based on the use of imported ores; while, in order to economically handle their ore supplies, both the furnace and the steel plants must be in units of considerable size. It is therefore altogether likely that the developments along this line will take place entirely as extensions of the activities of existing companies.

In the interior iron fields of the South, however, the possibilities of development are numerous and interesting. We may fairly expect, for one thing, that the next few years will show great progress in the manufacture of finished products, and that the percentage of pig-iron shipped North will decrease very markedly. There has, indeed, been great progress made in this particular line during the past year or two. The largest of the Southern iron companies no longer ships from two-thirds to three-fourths of its pig-iron output to Northern markets, as it did 10 years ago, but converts the bulk of its pig metal into steel at its own plants, and finally markets this steel in finished

form. Its example is likely to be followed by other important furnace interests as capital becomes available for the necessary first outlay on plant.

At the other end of the ironmaking process—the preparation of the raw materials—progress can also be expected. Rapid development in by-product coking and a more thorough preparation of the ores are the chief points to which attention may be directed profitably. As ores tend to increase in value there will be offered greater possibilities in the way of mining and concentrating the magnetites and hematites of the Blue Ridge and Piedmont areas. In the crystalline and semi-crystalline rocks—granites, gneisses, slates and quartzites—which make up the mountainous country to the east of the Great Valley, deposits of magnetite and of red and specular hematite occur at many localities. These deposits are as yet practically unworked, and their importance is of the future rather than of the past. Their distribution is more irregular than that of either the red or brown hematites, the expense of examining and opening them is larger and there is greater opportunity for making serious errors of judgment as to the value of any given deposit. But when all this is admitted few iron fields would seem to offer greater opportunities for intelligently-directed capital.

As to known distribution, it may be said that the magnetite deposits are most extensive in North Carolina, important in Virginia, of little known importance in Maryland, South Carolina, Georgia and Alabama, and known to be entirely lacking in West Virginia, Tennessee and Kentucky. The deposits of specular hematite are differently located, for the principal development of this type at present is in the well-known "gray-ore district" of Talladega county, Alabama, while similar ores are known to occur in adjoining counties in Alabama and Georgia, and isolated deposits of rich red hematite are found at a few points in Virginia and Tennessee.

The ores of this magnetite-hematite group are often naturally of high grade, ranging from 50 to 60 per cent. and over in metallic iron. Even when naturally lower in iron, they are susceptible to very satisfactory concentration, owing to their physical characteristics. There is little doubt that in the near future attempts will be made to mine ores of this type on a large scale, and to treat them by magnetic concentration when necessary. At present, however, the only active mines are those of the Pittsview district of Virginia, the Cranberry mines of North Carolina and the Talladega county mines of Alabama.

The main basis of Southern ore supply will, of course, always be the limy Clinton "fossil" ores, which are so abundantly distributed from central Alabama through Georgia and Tennessee to the Virginia line. It is this vast supply of Clinton ores which makes both possible and probable the development in the near future of a really great Southern iron industry.

Chicago Capital Co-operative in Southern Progress.

By JOSEPH T. TALBERT, Vice-President Commercial National Bank of Chicago.

[Written for the Manufacturers' Record.]

The author of this article is a Southern man. He grew up in the South during the reconstruction period. He is familiar with the conditions which existed there immediately after the war, and has kept in close and sympathetic touch with the development of that section during the past 25 years. Having been an officer of one of the leading commercial banks of Chicago for 11 years, and now president of the Chicago Clearing House Association, he is qualified to speak not only as a Southerner to Southern business men, but as a banker and business man of the North to bankers and merchants of his own city and of the entire Mississippi Valley. His article should be read with interest in both sections. Naturally, his views are practical, and they should commend themselves to business men.—Ed. Manufacturers' Record.

In a practical paper dealing with problems of trade, sentiment finds no place; but a clear understanding of our lack of business relations with the South necessitates the telling of some particulars of a series of events which brought about that condition which happily is now changing, even though slowly. In relating the story some sentiment is, perhaps, not out of place.

The close of the Civil War found the South prostrate. The ravages of war had been dreadful enough in the North, but the ruin was pitiable in the South. The flower of manhood slain, blood and treasure sacrificed, property destroyed, and all but her natural resources lost in merciless waste, the South was stricken, and she drank the cup of poverty to its bitter dregs. Existence was a desperate struggle.

These misfortunes were heavy, indeed, but they were slight in comparison with grave social and distressing political problems which confronted them, the like of which no people were ever so suddenly called upon to solve, and for which circumstances made them so helpless and wholly unprepared. Slaves were not only set free, but enfranchised. To a large element of the population liberty meant license. The writer's earliest recollections of these gloomy surroundings recalls the fact that practically every public officer in his native State, from Senators and Representatives down to legislators and all county and municipal officers, were colored men, fresh from slavery, for the most part illiterate, unable even to read or write, and, of course, the easy tools of corrupt politicians. Can the imagination picture more dismal, hopeless or discouraging conditions?

Upon top of all this came the final but inevitable burden of being obliged to bear the penalty of defeat her share of the heavy tariffs imposed to discharge the war expenditures of the Union and its growing pension lists. The courage and fortitude with which the people of the South faced these conditions and strove to solve their tremendous problems are attested today, after 40 years, by hundreds of thriving and prosperous towns and cities, by growing wealth and independence, and by splendid schools and colleges for both blacks and whites. The transition is a marvel. When all the story is told there will have been written a page of history which reflects glory upon the courage of American manhood and upon Anglo-Saxon blood.

During this dark period of reconstruction the South thought not of trade, but of building homes and firesides and of educating her youth. The small trade she had to give went to those few markets at the seaports and in the East, where she sold her cotton and where she sought and could obtain credit from year's end to year's end, even at usurious rates. During this period Chicago suffered a heavy and staggering loss in the great fire. She was herself a debtor, busy rebuilding the city and reaching out meanwhile with the small surplus capital she could command for the trade of the

rich country at her gates and that of the West and Northwest, which constituted her natural territory. Even had the South applied then to Chicago for long credit (and no other would have been of any benefit), it could not have been granted. Thus for more than a quarter of a century Chicago and the South grew each in its own way, not further apart or along diverging lines, but parallel; and they remained independent and almost unknown to each other.

The great Columbian Exposition brought them to recognize each other as desirable and friendly neighbors, and created a wish to know more of the affairs of each other. Even with limited acquaintance, mutual confidence has grown. Trade has been established, and the seed of a firm and lasting friendship planted in the soil of common interests. But the resulting growth of trade has been slow, and it is by no means so large as the present financial strength and mercantile importance of Chicago deserves and would sustain.

Bearing these things in mind, a delegation of members of the Chicago Association of Commerce, consisting of about 30 men, representing various lines of trade, recently made a visit to a number of cities in States of the Mississippi Valley south of Chicago. The trip was noteworthy in the scope and broadness of its purposes, as well as in its conduct, and in the probabilities of material achievements. The ultimate motives, of course, were to seek the extension of trade, but during the whole journey, of two weeks' duration, the purpose uppermost in the mind of each delegate was to become acquainted and to get as much information as possible. By this is meant not merely to receive personal introductions and to go through formal handshakings, visiting, sightseeing and the saying of felicitous things, but they were moved by a sincere desire to come in contact with Southern business men in their own environments, to study and become familiar with the resources and products of the South, to discover trade barriers where they exist, and to ascertain how to remove or minimize them, and finally to seek in what manner they might encourage and promote the sale of goods by Chicago in the South, and also to learn how they should set about to create here large and dependable markets for Southern goods.

In a broad way, no commercial undertaking could be more praiseworthy. Such a mission on the part of responsible business men, who laid down their own affairs and went intent upon meeting men of like kind, to study their needs, and without spectacular accompaniments seek how to supply those needs, could not fail to arouse interest as well as to engender the most cordial and friendly feelings. These things, at least, were accomplished, and much more. It was a source of gratification and encouragement to every member of the delegation that not one word anywhere was spoken unkindly of Chicago or in a spirit of criticism of the methods of our business men. Whatever the actual results may be, the conception and execution of the whole trip sets a high standard in clean, praiseworthy and legitimate effort on the part of a city to promote its trade. The advantages of Chicago were, of course, pointed out, but not at any time to the disparagement of the rightful claims of other markets.

The purpose of this article is to set forth the relations and the attitude of Chicago toward the South in a banking way, rather than in respect to trade, and to do so in as comprehensive a manner as possible within the limitations of a magazine article.

Candor requires that the subject be stripped of sentiment, and that discussion be confined to the facts. It would be worse than useless to deceive ourselves or our friends in the South as to the status of our banking relations, or as to the possibilities of the future.

Despite the tremendous growth of the banking power of Chicago and the wide extension of its influence in the past 15 years, during which time the deposits in the State and national banks of the city have increased from \$179,000,000 to about \$700,000,000—an amount so great that we ourselves do not appreciate what it means to the trade of the country—we have made practically no inroads into the banking business of the South. Texas and some of the newer Southwestern States have been good fields for the cultivation of banking relations, but in the old South—that part lying east of the Mississippi and south of the Ohio River—not much impression has been made except along the borders and in the larger centers. This is not due to any lack of confidence in us, nor of appreciation on their part of the financial strength of Chicago banks. There is no prejudice anywhere in the South against doing business in Chicago, but owing to the present status of Chicago's trade in that section close and extensive banking relations, outside a few of the larger cities, are not now possible.

A business man has no occasion to maintain a bank account where he does not trade; and as a corollary, a bank has no occasion to maintain balances in cities with which its own community enjoys no close trade relations. The extent and character of banking transactions between one section of the country and another are measured and regulated by the volume of trade between those sections. The force of these truisms can better be understood when the fact is kept in mind that one of the chief functions of a bank is to supply credit for carrying on trade.

If the banks of Chicago hope to establish satisfactory and profitable relations on a large scale with the banks of the South, it can only come about as the natural result of trade extension in that section. It is therefore to the interest of Chicago banks to do all they can in a legitimate way to encourage trade. Banking relations cannot be forced, nor can trade be turned from its natural channels except at a loss to one or both sides. Business acquired on unnatural terms never is satisfactory, and cannot be sustained. It is not sound banking to buy business upon terms which healthy and legitimate competition does not establish. All efforts, therefore, to build up banking relations, except as they may be the outgrowth of trade, are likely to prove as easy and profitable as endeavoring to make water flow up hill.

The feeling of friendliness which was everywhere shown by Southern bankers toward Chicago is heartily reciprocated by our banks. All of them are now, and have been for 10 years, ready and anxious to promote closer relations with the South. At several places the statement was made by our hosts that during the panic not only credit, but currency was obtained by Southern banks in Chicago when it could not be had elsewhere. This no doubt was a fact in some cases, and it may be said also that the action of any individual bank in Chicago in this respect was characteristic of the broad policy which they all pursued at that time. It might in truth be acknowledged that the policy was not entirely unselfish. Our bankers realized that the important places to send whatever currency they had to spare were not the large cities, where funds would in all likelihood be locked up and carried as "reserves," but to the smaller cities and towns, the inland places, where the currency would circulate from hand to hand and reach the cotton fields of the South and the grain fields of the Northwest, there to be used to bring to primary markets the great staples—cotton and wheat—which were the

only raw commodities we had to export quickly and in large amounts, which could in such a crisis buy and bring to us foreign gold.

Chicago banks do not claim any special credit, nor ask any recompense for their action, however praiseworthy it may have been. It was merely banking in that broad sense which should characterize the management of large and successful metropolitan banks. It was no more than a high duty, faithfully and intelligently performed.

However, all Chicago banks should feel proud of the praise so freely given by their Southern friends, who said that notwithstanding the slender claims they had upon our resources and credit, deserving banks and business houses in the South did not apply here in vain for credit during the panic.

While seeking ways and means for the promotion of trade in the South we may be assisted to a better understanding of how this may be done by first ascertaining what are the chief obstacles now in the way. It is certain that the South is rich and productive, and that it is growing and developing. From 1900 to 1907, inclusive, the deposits in all the banks of the six States we visited, namely, Alabama, Arkansas, Kentucky, Louisiana, Mississippi and Tennessee, increased from \$162,208,000 to \$433,006,000. This is an increase of over 260 per cent. in eight years, or an average increase of over 30 per cent. a year. These figures compare very favorably with the showing made by banks in three of the leading agricultural States of the Northwest—Minnesota, North and South Dakota—during the same period, when the deposits of banks in those States increased from \$102,037,000 to \$275,000,000.

It is not too much to claim that our commanding position as a great central market and our proximity to the whole valley, together with splendid transportation facilities, entitle us to a liberal share of Southern trade, and it is a fact that the South is willing to buy goods of us, provided it can be done to advantage or on terms of equality with other markets. In these circumstances it may well be asked why the trade of Chicago in that region has not grown and flourished.

In view of what has already been said about trade, the answer at once suggests itself. Chicago is not a market for cotton. Until recently cotton was practically the only great product which the South had to sell, and her trade affiliations followed that commodity; but conditions are changing, and her products are multiplying. The banking relations we now have in the South (including Texas) grow largely out of the fact that Chicago is a market for timber and cattle, and also for vegetables and fruits, rice, sugar, cotton oil and poultry. The bulk of the banking business we now enjoy there is in connection with these and allied industries.

This covers the whole case, and the trade barriers in the South will not disappear unless and until we create and develop ability to deal with her and to buy her goods. With the diversification of industries in the South and the development of her native resources, which she is beginning to find the means to do in part with her own capital, and in part with Northern money (which is not so timid of the South as it was in years past), there will be a large increase in her output of raw materials and manufactured goods, which can be advantageously marketed here. It is in this direction we must look for the increase of our purchases from them until a way can be found to take more cotton, and at least assist in its production and marketing. When this takes place the establishment and maintenance of extensive banking relations with Chicago will not only be natural and easy, but necessary. In the meanwhile, it is for us to discover in what other ways we may be useful to banks in the South, and thus lend encouragement and hasten the trade movement.

On this point the immediate outlook is not reassuring, but the future holds much in store. Like a great stream, trade flows in natural channels, following always the course of least resistance; or to put it in a commercial way, trade follows the course of greatest profit. The history of commerce proves this fact. The course of trade may continue uninterrupted for centuries and then suddenly be shifted by the rising of new influences which create new conditions, or establish greater advantages elsewhere. A good example may be found in the mighty changes wrought in the trade capitals of Europe by the growth and spreading of the influence of the Hanseatic League. A better example may be found in later times of changes caused by the invention of the steam engine and its application to transportation by land and water.

Throughout the whole history of trade mighty factors have operated to shift and change its currents. Such factors are no less potent now than they were centuries ago. The one thing which will mightily influence the trade of the whole Mississippi Valley and be far-reaching in effect will be the construction of the deep waterway from Chicago to the Gulf. This is not a dream, but a reality, the accomplishment of which is as certain and not much more remote than the opening of the Panama Canal. In the speedy conclusion of this great undertaking every inhabitant of the Valley from Montana to Texas, from Duluth to New Orleans, from Cleveland to Mobile, is vitally interested. It is not a political nor a sectional question, but a great commercial project affecting the welfare and the prosperity of 50,000,000 of our people, and in time perhaps double that number. The people of Chicago have expended \$63,257,000 upon the Drainage Canal up to October 1 last, which is large enough and deep enough to float any vessel on the Great Lakes or on the Gulf. The people of Illinois have by a recent vote approved a constitutional amendment which provides for an issue of \$20,000,000 of bonds by the State for carrying on the work and completing the canal to the Illinois River. It remains for the Government, by dredging and otherwise, to deepen the Illinois River and clear it of obstructions, and where necessary to improve the channel of the Mississippi, so that we shall have from Chicago to the Gulf a deep waterway capable of carrying ocean vessels. When this is done as proposed, it will be equivalent in carrying capacity to five double-track railroads. There is no question before the people of the Mississippi Valley more important than this. It means as much in the future development of the country, and marks as important a stage of that development, as did the Louisiana purchase a hundred years ago. The people should demand, and when they understand the question they will demand, immediate action by Congress. That action should be prompt and commensurate with the great undertaking. In selecting Representatives to Congress one of the prime requisites of every candidate should be unequivocal declaration in favor of immediate, liberal and continuous appropriations for this work. The initial appropriations should be made at the present session, so that the work of the Government may be pushed forward concurrently with that which will be done by the State of Illinois. The Government should carry on the work continuously and vigorously, so that the whole shall be completed by the time the work undertaken by the State is completed in the Desplaines River. If there be any question as to the wisdom of such expenditures by the Government, or any doubt as to whether they pay the people, the quotation of a portion of an article by Mr. S. A.

Thompson, field secretary of the National Rivers and Harbors Congress, which appeared in the Thanksgiving number of the *Independent*, ought to set these questions at rest. The statements are authoritative, and may be accepted as facts:

"The greatest waterway in the United States, by far the greatest inland waterway in the world, is that composed of Lakes Superior, Michigan, Huron and Erie, with their connecting channels, Lake Ontario, for reasons which will appear later, having participated but slightly in the marvelous development which has taken place on the four lakes which lie above Niagara Falls. Up to the close of 1907 there had been expended by the Government of the United States upon the harbors and connecting channels of these lakes \$85,000,000 in round numbers. This is an expenditure worthy of consideration even in this day of large things. What return has been received therefrom? Has it paid? And how much?

"Proof that it has paid, and paid largely, is abundant, easily found, indisputable, overwhelming. But to ascertain fully and accurately how much it has paid is not so easy. One way of getting at the benefits of waterway improvements is by comparing the relative costs of rail and water transportation. From the records kept at St. Marie's Falls—commonly called 'The Soo'—it appears that during the season of navigation of 1907 (April 22 to December 15) there were carried into and out of Lake Superior 58,217,214 tons of freight. This was carried an average distance of 828.3 miles at a cost of \$38,457,345, which makes the average charge per ton per mile .8 of one mill. Suppose that this tonnage, instead of being shipped by water, had been sent an equal distance by rail, how much more would its transportation have cost?

"According to Poor's Manual, the average freight rate received by the railroads of the United States in 1907 was 7.82 mills per ton per mile; 58,217,214 multiplied by 828.3 multiplied by .00782 equals 377,090,700, and \$377,090,700 minus \$38,457,345 equals \$338,633,364. That is to say, the direct saving through decreased cost of transportation on the business of one year amounts to over \$338,500,000, or nearly four times the total Governmental expenditure on all the lakes since their improvement was begun.

"Apparently it has paid! But the saving for a single year constitutes only the merest indication of how much it has paid. Let us look further.

"The American Canal at 'The Soo' passed into the control of the National Government in 1881. From the opening of navigation in that year to its close in 1907 there have been carried into and out of Lake Superior 496,323,813 tons of freight. Calculated by the same method as that used above, the direct saving thereon, due to the lower cost of water transportation, amounts to \$2,918,000,000. But the tale of Lake Superior's commerce is not yet fully told, for between its opening in 1855 and its transfer to the United States in 1881 there were carried through the 'Soo' Canal 12,162,320 tons of freight, making a total, up to the close of 1907, of 508,486,133 tons. There are no data available from which to calculate the exact saving in the cost of transportation on the tonnage of those earlier years, but it was undoubtedly enough to bring the total up to around \$3,000,000,000.

"Thus far we have dealt only with the traffic of Lake Superior. Unfortunately, it is not possible to ascertain the tonnage of all the lakes with anything like the same accuracy. Most of the port statistics published give the net registered tonnage of vessels. Net registered tonnage is purely a matter of measurement, and tells very little as to how much a vessel can carry, and absolutely nothing as to how much it does carry. But it is of interest to note in passing that the registered tonnage of the vessels entered at the ports of the Great Lakes, American and Canadian, which amounted to 115,000,000 tons in 1907, exceeds the combined entries of the principal ports of Great Britain, Germany, France, Holland, Belgium and all the ocean ports of the United States.

"While the direct saving on the commerce of all the lakes cannot be exactly calculated, the data being incomplete, a very conservative estimate makes the saving for 1907 no less than \$550,000,000, and for the whole period \$5,000,000,000. Even if we cut this amount in half, to satisfy some ultra-conservative mind, \$2,500,000,000 would seem to be a fair dividend on an investment of \$85,000,000.

"The direct saving, due to the lower cost of transportation, on freight actually carried by water, great as it is, is only the first item of the manifold benefits derived from the improvement of the lakes. Waterways not only carry far more cheaply than railways, deriving a large profit from rates which are below the actual cost of railway operation, but they bring about an enormous indirect saving through the lower rates of railway transportation which the competition of the waterway compels. Before the lock was built at the Cascades, on the Columbia River, the railway rate from Portland on nails and goods of that class was \$6.40 per ton. On the day the lock was opened, so that steamboats could go through, the railway rate dropped to \$2 per ton. Scores of similar instances could be adduced if they were needed, but we have the testimony of prominent railroad men to prove that the competitive influence of the lakes modifies railway rates over a large part of the continent. Because of the enormous volume of railway traffic thus affected, it follows that the indirect saving, through the decrease in railway rates produced by the competition of the lake route, is probably as great as the direct saving on the tonnage actually transported by water.

"Strange as it may seem at first thought, it is none the less true that no other interest has been more largely benefited by Governmental expenditures upon the lakes than the railways themselves. The fundamental reason for this paradoxical result is that the essential function of the waterway is the carriage of those commodities in which weight and bulk are large in proportion to value, and which must, therefore, be moved cheaply if moved at all. The development of manufactures which follows an abundant supply of cheap raw materials furnishes to the railway a traffic which demands greater speed of movement, which is of much greater value in proportion to weight, and which, therefore, is able to bear higher charges for its transportation. Out of the 58,000,000 tons of freight carried through 'The Soo' in 1907, 51,000,000 was made up of iron ore and coal. Nine-tenths of the traffic handled on the lakes consists of raw materials. The value to the nation of the development based upon the raw material so earned defies both computation and comprehension.

"It would not be surprising if the reader who has followed the argument thus far should find a question rising in his mind. It has been claimed that the expenditure of \$85,000,000 upon the lakes has produced enormous savings in the cost of transportation, both directly and indirectly; that it has not only furnished effective competition for the railroads on the one hand, but has increased their traffic and their revenues upon the other; that is, has at one and the same time raised the price of wheat to the farmers of the West and lowered the price of flour to consumers in the East and in Europe; that is, has transformed the lake fleet, promoted the growth of lake cities

and increased the revenues of the Government; and that is, has given to the United States the primacy of the world in the manufacture of iron and steel.

"Most of the benefits produced by waterways arise from the cheap transportation furnished thereby, and in the matter of cheapness even the lakes must yield the palm to the Ohio and Mississippi rivers. Coal is carried from Buffalo to Duluth-Superior for .3 of a mill per ton-mile. But this rate is made in connection with return cargoes of ore or grain, which pay a higher rate, and during the present season vessel-owners have tied their boats up rather than carry coal at this rate, returning light. Whenever there is a sufficient stage of water on the rivers mentioned, however, coal is carried from Pittsburg to New Orleans for one-third of a mill per ton-mile, which price includes the return of the empty barges 2000 miles up stream.

"Another important advantage of the waterway over the railway is the volume of freight which can be moved at one time, and here again the lakes must take second place to the rivers. For the steamer Sprague has carried from Cairo to New Orleans a tow of barges containing 57,500 tons of coal, which is believed to be the greatest cargo ever moved at one time in the history of the world.

"It may be asked why, if such results can be attained by the rivers in their present condition, the demand for their improvement is so strong. The answer is that these results are attained only when there is a boating stage of water, and boating stages are as uncertain as the winds of heaven. On one occasion, some 10 or 12 years ago, the interval from one boating stage on the Ohio to the next was 11 months. This makes plain the underlying reason for the difference in the relative growth of the lake cities and the river cities.

"This great work of waterway improvement must be done by the National Government, because the nation claims exclusive jurisdiction and exercises supreme control over navigable waterways. But with power goes responsibility. If the river cities have grown more slowly than the lake cities, it is because Congress has improved the lakes and left the rivers unimproved. If the commerce of Lake Ontario has failed to keep pace with that of the other lakes, it is because Congress has failed to furnish it as good a connecting channel as has been given them. If the United States cannot cope with Germany in the great battle for world commerce, it is because the Reichstag has developed German rivers and canals and our Congress has failed to develop American waterways."

If such amazing results follow the improvement of our waterways on the Great Lakes, while they remain available practically only for inland transportation, how much greater benefits would follow when the way is opened for such traffic on the high seas? If the construction should cost as much as our present national debt, it would be but a small price to pay for the returns to the people in the development of our commerce with the world, the enhancement of all land values, especially of timber lands, and the enormously increased values of farm products.

In the meantime, while the building of the waterway is going on, we may extend our trade gradually by united efforts on broad lines. Manufacturers and merchants when requesting remittances for invoices should ask for return in "Chicago Exchange," and not in "New York Exchange," as many now do. Banks and merchants should send out their representatives, and especially well-trained credit men, to canvass that country, familiarize themselves with the resources and wealth of the South which furnish a basis for credit. Many of these credits are as sound and as safe as any of like kind in the North. Our banks should be ready to discount freely the obligations of Southern banks secured by their receivables. We should discount out of proportion in many cases to the amount of balances maintained with us. We should be especially liberal during the cotton season, and should lend at rates in competition with Eastern banks. Such lending, in connection with unrestricted shipments of currency to the South and reasonable collection terms for their Northern and Eastern items, will bring good results in the way of deposit balances.

Our bankers should bear in mind the tremendous burden which is thrown each autumn on Southern banks in financing the cotton crop. This year the value of that crop will aggregate \$650,000,000. This is practically all new wealth, grown out of the earth, and it exists in the form of an exportable commodity that brings in foreign gold. It represents much more in actual wealth than a rise in stocks, securities or property values of an equal amount. The cotton crop must all be paid for in cash by the banks on the spot. A large percentage is paid in currency, especially at primary markets, while the whole crop must be moved to the central markets within a period of four or five months. Heavy borrowing by Southern banks is, therefore, necessary, and should be well understood and encouraged. Loans may be made there with as much safety as the choicest commercial paper in our own markets can be bought. We have too long permitted other cities to enjoy a monopoly of this business. The South is very much alive, and growing rich. We are not awake to our opportunities if we fail to realize these facts and turn them to good account.

In the line of suggestions as to how we may increase the market here for Southern goods, particularly cotton, it might not be found impracticable to establish large factories along our Drainage Canal, to be operated by water-power. Every dollar of cotton our mills bought in the South would bring us trade in return. The mills so situated would be in a strong position to distribute cotton goods in the Mississippi Valley, and as much more could be shipped to the Orient down the river and through the Panama Canal as the Chinese and Japanese would take.

The South is talking of cotton warehouses and the issuance of negotiable certificates on cotton stored in such warehouses. It would seem to be as practicable to store cotton and to make loans against it as it is to store grain. There does not seem to be any good reason why storehouses similar to the great ones in Memphis should not be established in all the cotton centers of the South, and there is certainly no reason why Chicago banks should be unwilling to make liberal loans against cotton stored in them. Banks in Liverpool, Hamburg and Bremen have for years carried cotton for importers and spinners. Why should we not do so for our spinners and dealers? An undertaking on these lines has recently been successfully carried out here for the storage of wool on a large scale for Western growers.

Finally, Chicago and the South should work together to secure more equitable freight rates. By this is not meant necessarily decreased rates, but Chicago should have the opportunity to compete for Southern trade without unjust discrimination, which is now evident all over the South. Chicago seeks no advantage in this respect over any market, and needs none, but its merchants and manufacturers should insist upon a "square deal," and in this the Southern merchants should help them.

The point that must be kept in mind at all times is that in order to turn the tide of

trade from the channels which circumstances have made for it, we must make ourselves useful to the South, show our confidence by lending freely against their good securities, take all of their goods we can manufacture or consume, and thus place them in position to trade with us. It cannot be doubted that the South will be found ready and willing to do its part.

NEW TRADE ERA FOR NEW ORLEANS.

By WALTER PARKER.

[Written for the Manufacturers' Record.]

Mr. Walter Parker, who is the cotton editor of the New Orleans Times-Democrat, has spent his spare time during the past 10 years in writing special articles for the promotion of the welfare of the South. He was especially influential in work for the enactment of the Federal Maritime Quarantine Law a few years ago, and for the adoption recently by the people of Louisiana of the constitutional amendment exempting mortgage loans from taxation.

By a State constitutional amendment declaring loans made on real estate mortgage collateral free from all taxation, and by a legislative enactment declaring the domicile of the lender the domicile of the loan, the State of Louisiana and the city of New Orleans have been given the one opportunity of the first class needed to make commercial development on a big scale practical and quickly operative. The live business man residing in a State which enforces only the best laws its people can devise cannot fully realize the handicap the same character of man in New Orleans has labored under when formerly he heard time and again the foreign or Northern banker's stereotyped reply to his inquiry:

"I believe New Orleans offers many opportunities for profitable and safe investments, and I would like to accommodate you with a loan, but so long as the 27-mill tax on mortgage loans remains operative I cannot do business in the State of Louisiana."

These, or similar words, have repeatedly blasted the hope of enterprising New Orleans business men, promoters, contractors, builders, manufacturers and others who, unable to secure needed money on good collateral at home, have gone elsewhere to bankers, life insurance presidents and mortgage-loan concerns during years past, and their refusal, because of a foolish law, has been responsible for more lethargic development, stupid stagnation and torpid delay in the Pelican State than the pages of history will ever record.

The full force of the swing from restricted endeavor to free and untrammelled opportunity has not yet been felt. The anti-mortgage-loan tax amendment did not begin to exert full effect until January 1, 1909. But before then millions of capital had been pledged to various enterprises long handicapped by lack of funds and ranging in their scope from 16-story steel bank buildings, modern hotels, sky-scraper office buildings, modern wharves and landings, and a public belt railroad, down to a motor-car cab service. Out in the interior interurban railroads, municipal sewerage, water and lighting plants, big sawmills and timber tracts and sugar plantations, long burdened with usurious debt, are now being provided with working capital or being financed as new enterprises, with 5 and 6 per cent. money supplied by investors at New York, Chicago and other Northern cities who are eager to secure the favorable interest rates obtainable in Louisiana.

Ultimately many changes of an important character will result from the opening up of Louisiana resources to outside investors, and in the end the people will be richer, the State better off in every way and the city of New Orleans placed on the road to gain the marvelous inheritance her favorable location guarantees her as a birthright.

Because money has been high the people of New Orleans have lacked many of the conveniences and comforts enjoyed by the residents of every other city of the first rank in the country. The homes of the tenant class have been of the cheapest construction, and yet rents in New Orleans have always been high. Such an elemental necessity as a modern apartment-house has been unknown in New Orleans. True, in recent years some ancient boarding and rooming houses have been turned into so-called flats and apartments and fabulous prices have been obtained in the shape of rent, and on St. Charles avenue a very few modern apartment structures have within the past year been erected, but these have all catered to wealthy people, and not until Northern investors, looking for good things, learned of the abatement in Louisiana of all taxes on mortgage money were definite steps taken to give to the people of New Orleans comfortable, convenient and well-equipped flats within easy walking distance of Canal street. Only a few days ago options were secured on a number of very desirable locations for this purpose, and within the next year many two, three, four and five-room modern apartments will be available at prices within the reach of all classes seeking close-in homes.

Ten years ago commercial property in New Orleans was salable only at ridiculously low values. Two or three years ago prices of this sort of property advanced suddenly and reached a level way beyond the earning capacity of the many ancient and out-of-date buildings which occupied the most desirable spots. An attempt was made to improve the buildings, and in a number of cases modern buildings were erected, but the demands for money proved too great for the restricted lending power of local investors and local banks, and, outside capital being barred, the building boom subsided.

In the meanwhile rents in the commercial district had been advanced to a level out of keeping with the conveniences and utility of the buildings and out of keeping with the volume of business available under the restricted financial facilities of the city. Under the beneficent influence of untaxed working capital all this is now under process of readjustment. Low rates of interest increase the value of good business sites and decrease the value of obsolete buildings. It follows as a good business move that the owners of desirable real estate are improving their investments by tearing down the old structures and putting up modern buildings of maximum utility and maximum convenience.

There is one Canal-street corner which went begging 10 years ago for a purchaser at \$85,000. Today the owners would not sell at \$400,000. On an \$85,000 valuation the old building produces a 25 per cent. revenue, but the returns on a \$400,000 valuation are laughably small. This property could easily be made to produce 10 per cent. net were a \$600,000 modern building erected on the \$400,000 lot. About the same proportions apply to most of the old buildings on Canal street between Decatur and Claiborne, and on Camp, Decatur, Chartres, Magazine, St. Charles, Royal, Carondelet,

Bourbon, Baronne, Dauphine, Dryades, Rampart and other cross-streets within two or three blocks of Canal street.

Millions of dollars are now seeking safe long-time investments in New Orleans, and within the next few years it is more than probable that tens of millions will go into buildings in the Canal street district.

The Hotel Grunewald is probably the most spectacular demonstration of the desperate straits to which the enterprising men of New Orleans had been reduced by the foolish tax on investment money, and at the same time stands a monument to the pluck and the abiding faith in the future of New Orleans of one man.

Theodore Grunewald, a youngster whose father had made a fortune as a merchant, long realized New Orleans' need for genuinely modern hotel facilities and planned the building of a \$2,000,000 annex to the old Grunewald Hotel, which represented an investment of \$1,000,000 and of which he was proprietor. Two years ago he signed up his contracts and effected an arrangement for the local financing of \$1,000,000 worth of 5 per cent. bonds. When the time came to obtain money on the bonds money in New Orleans was scarcer than ever, and it was not forthcoming. This youngster believed the mortgage-loan tax would be repealed, believed the new hotel would pay, and, nothing daunted, bundled up his bonds and about all the other collateral he could lay his hands on and pledged the packages to secure time and call loans aggregating \$1,200,000, on some of which he had to pay frightful interest, on all of which he had to pay 3 per cent. in addition to the actual worth of the money to cover the 27-mill tax the State was supposed to collect, but which the lender invariably pocketed, plus 3 per cent. brokerage. This on A1 collateral! Arrangements have now been made to sell the bonds and take up the outstanding notes, and since the bonds bear 5 per cent. interest, and untaxed investments of this excellent character are profitable at 4 or 4½ per cent., the premium above par realized should amount to a good many thousands of dollars.

All over New Orleans there are large warehouses, ancient establishments and other structures, relics of the days when old-time business methods and lack of competition made them profitable. These properties are now being bought up and will eventually be turned to account in many ways to meet the business needs sure to arise with the trade expansion immutably incident to the creation of conditions which will attract and not repel investments and trade of all kinds.

In the region along the river front there are a number of decaying cotton warehouses which long ago outlived their usefulness because the excessive cost of draying cotton over almost impassable streets, together with other heavy charges, destroyed their one-time profitable business.

With cheap money now available, President W. B. Thompson, of the New Orleans Cotton Exchange, in conjunction with a joint committee composed of seven New Orleans bankers and business men and seven members of the Farmers' Union, is now working out the details of a huge plan which will give New Orleans a monster cotton warehouse on the river front, alongside of which boats from the rivers and ships from all countries may come, and into which belt rail lines will bring cars from all roads entering New Orleans. Machinery equipment of the most modern type will lift the bale from the car or boat and an overhead electric trolley will place it in the sampling rooms or in its proper compartment. The warehouse will be several stories high, fire-proof throughout, and the bales will rest on tiers of iron bars in such a way as to permit of the removal of any bale at any time without disturbing any other bale. Under the existing system sometimes as many as 100 bales must be moved before a single bale can be taken out of a pile.

Some of the advantages to accrue from such a warehouse are:

The issuance of a practical negotiable warehouse receipt which any banker will gladly accept as gilt-edge collateral. The availability of such collateral and the fact that outside money is no longer taxed, in the opinion of President John J. Gannon, of the Hibernia Bank and Trust Company, will attract millions of dollars from Europe to New Orleans. The reduction in the cost of handling, storage, sampling and insuring will amount to at least \$1 per bale under present costs.

The protection of the bale from weather damage and the ability of the warehouse to deliver cotton into ship's hold immediately upon receipt of an order will, in the opinion of experts, increase the worth to the exporter of every bale so handled by another dollar.

Secretary Henry G. Hester, of the Cotton Exchange, is authority for the statement that 6,000,000 bales of cotton are annually grown in the legitimate territory of New Orleans. Under present conditions only about 2,500,000 bales come to this port. Nothing now is done to attract cotton. The banks have been unable to finance any cotton business, or any business at all other than that of their regular customers, but under the new law plenty of money for such purpose will be available. Mr. Thompson's warehouse project, which, it is expected, will be financed for about \$5,000,000 at 4 per cent., will furnish attraction enough to bring all the cotton New Orleans is entitled to to this port.

The biggest phase of this big enterprise is the far-reaching change it will work in the method of handling and distributing the surplus supply of each cotton crop. Because money for financing this important portion of the crop during the fall and winter has always been lacking, Liverpool has accumulated it and held it there until the mills of the world needed it. This has resulted in the carrying of a very large stock of actual cotton at Liverpool the year round, all the profits on insurance, handling, storage and financing going into English pockets. Since much of this cotton goes from New Orleans to Liverpool and is ultimately reshipped to some other part of the world, New Orleans, with economical storage facilities, built with cheap money and issuing a warehouse receipt any banker in America or Europe will accept as A1 collateral, surplus cotton of the character under discussion, as well as "distressed" cotton, which is now the bane of the farmers' existence, will gravitate to New Orleans, to be eventually shipped direct to the country needing it. Some of the money to be used in financing such cotton at New Orleans will be attracted from England by the superiority of the collateral offered.

During many years past factories of all kinds in New Orleans have deemed it essential that they should be exempt from taxation in order to hold their own, and a great protest went up from them a short while ago because the Legislature of Louisiana refused to extend this exemption for another 10 years. In a little while, however, the local manufacturers began to realize that the repeal of all taxation as applied to foreign investment capital opened up a real future for them, and that, with the thou-

sand and one ramifications of the broad business enterprise sure to develop, the field of their operations would be widened and special privileges no longer be required.

Cheap money will bring business opportunities that will necessitate improved transportation facilities, and in this connection the opening up of the inland waterways and the revival of waterway traffic promised will play a prominent part. The major projects now being urged upon Congress include the Chicago Ship Canal, which will give the metropolis of the West an all-the-year waterway route to the port of New Orleans; the improvement of the Upper Ohio, which will turn Pittsburg's immense iron and steel exports from the Atlantic seaboard to the Gulf by way of New Orleans; the improvement of the Upper Mississippi and the Missouri, which will greatly augment the grain and flour exports of the Northwest through New Orleans.

The Atlantic Coast people have planned a practical protected waterway from Boston to the Florida Coast. The Gulf people have planned a similar waterway from the Atlantic across Florida to New Orleans. The people of Louisiana and Texas are urging Congress to complete the waterway from New Orleans, by way of Galveston, to the Rio Grande. To the southward the Panama Canal is nearer New Orleans by 600 miles than to any other large United States port.

Thus, New Orleans is really the hub, and the several sections of the proposed great inland waterway systems of the country are the spokes. Already some far-sighted business men have begun to calculate upon these advantages, and these calculations even now are influencing some investments.

So much for the bigger things that receive their impulse directly to the encouragement extended the investor by the people of Louisiana at the polls on November 3.

On every hand there are evidences of smaller, but in the aggregate no less important, collateral forces at work in promoting the upbuilding of a great modern city of big business affairs.

In New Orleans cab hire is almost prohibitive, a charge of \$1 for a single passenger being collected for a distance of half a mile or less. A motor taxicab concern, attracted directly by the mortgage-loan tax repeal amendment, is now arranging to inaugurate a complete service at a cost to the patron of 30 cents for half a mile for one passenger or four. Such a service will do more to bring about the paving of the unpaved streets than any other single force, since every passenger jolted will become an ardent good-roads advocate. It will also mean the elimination of the horse-cab street stands, with their attendant filth.

Cheap money will cause the opening up of several very large tracts of land adjacent to the city, which will mean that after more than a century New Orleans citizens will begin to enjoy the benefits of suburban homes, and eventually some 40 miles of shore line on the city side of Lake Pontchartrain will be reclaimed and dotted with country villas. The heart of the shopping district is only five miles from the lake.

Over the State farmers, merchants and business men generally are now, or soon will be, in position to obtain badly needed funds at 5 and 6 per cent. interest. Heretofore 8, 10 and 12 per cent. has been common. What this saving means to the sugar planter, who sometimes needs as much as \$100,000 of borrowed money to finance his crop; to the cotton-grower, who usually requires help to carry him to the marketing season; and to the merchant, who simply cannot discount his bills with 10 per cent. money, is obvious.

Not a business, not an enterprise and not a natural resource in the State of Louisiana has ever enjoyed the advantages available in the more advanced States. Consequently, the uplift that is sure to follow the revolution that has taken place in the matter of opportunity will be far greater than would otherwise be the case, and the inevitable result will be a broadening of the public viewpoint, a generally beneficial collateral effect and the development of a tendency to wipe the cobwebs away and push the State of Louisiana and the city of New Orleans to the front rank in the large affairs of modern life.

One glance at a map of the United States will demonstrate the huge advantage of location the gateway to the Mississippi Valley enjoys, while a bit of investigation will prove conclusively that the step the people have taken is the result of an awakening that will count for much in the years to come.

ST. LOUIS and the SOUTHWEST, PAST and PRESENT

By BRECKINRIDGE JONES, President Mississippi Valley Trust Co., St. Louis.

[Written for the Manufacturers' Record.]

It may be said that when Pierre Liguette Laclede and his company of fur traders selected St. Louis as their trading post the development of the Southwest began. It was to this center the trappers came with the pelts, and it was from this center they carried back with them into the wilderness the means of turning that wilderness into a country with villages, even though few and far between. It is said that this fur trade annually amounted to \$200,000.

In 1770 St. Louis boasted of 40 families and a small garrison of soldiers, and at this time the Southwest was a wilderness whose roads were blazed trails. Since then St. Louis has become the fourth city in size in this country, with a population estimate¹ at 750,000, and the unknown Southwest has become the great Southwest, with a population of 13,000,000. The growth of the city and the growth of the territory have gone hand in hand, and it is to St. Louis as the chief factor that this section owes its development. The Southeast had Pittsburg, Cincinnati, Louisville, New Orleans, Atlanta and Savannah to look to, but the Southwest was dependent upon the city which old Pierre Laclede had taught them was a market for their goods. In saying this I do not mean to minimize the part New Orleans played in the early days, but that city was more occupied with the Gulf Coast, which finally absorbed nearly all of its attention.

Situated near the geographical center of the United States, upon the Mississippi River, the greatest inland waterway, St. Louis was compelled to be the gateway between the North and the South, the East and the West, and while it has played its part toward helping the growth of all sections, the fact of being the one great metropolis and the first on the borderland of that great area, which resided in solitude while the Eastern States were populous enough to win a war, forced it to stretch forth the helping hand to awaken the sleeping forests. St. Louis has been true to its mission.

It had the natural advantage of location on the Mississippi River, and boats built by St. Louis capital gave to the towns that sprang up along this waterway the means of getting their products to market. But those who have lived here have always been

keenly alive to the necessity of transportation facilities in order to develop the country, and even in the French days they did what they could to furnish the most approved means of freightage. There is now in St. Louis a Kings Highway Boulevard, a memorial to the progressiveness of those French settlers who proposed a broad road for wagon travel from the town of St. Louis through the Southern wilderness to New Orleans, and because it was to be a royal road, named it for their King.

When the steam railroad became efficient, St. Louis immediately saw what it meant to itself as a city and to the contiguous territory. Its people were always willing to encourage its construction. The discovery of gold in California turned all attention to the West; the urgent need was for transportation in that direction, and it was Col. Thomas H. Benton, Senator from Missouri, who, on February 7, 1849, introduced a bill for the location and construction of a central railroad from the Mississippi to the Pacific Ocean. Later in this same year he delivered a memorable speech in Pittsburg, during the course of which he said: "St. Louis was directly in the highway, not only to the Pacific Ocean, but to Canton, China, and a railroad would be made to the Pacific either by the help of the Federal Government, or, without that aid, by the force of circumstances and the progress of events." As a result of that speech a national convention was called to meet in St. Louis, and was presided over by Stephen A. Douglas of Illinois. It is true that Omaha was made the terminal of the Union Pacific, but this was due to the imminence of the Civil War and the desire to keep the line out of a State which had so decided leanings to the Southern cause as Missouri. However, it was to St. Louis and Missouri that the West is indebted for this line.

Southeast Missouri showed it was rich in minerals, but there was no way to market them. St. Louis capital saw the necessity, and in 1851 formed a company to build the St. Louis & Iron Mountain Railroad, which now extends through Arkansas to Texarkana.

There was no adequate means of transportation between St. Louis and Kansas City on the west, so St. Louis men in 1850 formed a company to build the Pacific Railroad, now part of the Missouri Pacific. When the first spadeful of dirt was dug, on July 5, 1851, there was a great celebration in the city. It was the Southwest branch of this road, later known as the South Pacific, then the Atlantic & Pacific, which developed into the St. Louis & San Francisco Railroad, now running through the Southwestern States of Missouri, Arkansas, Kansas, Texas and Oklahoma.

St. Louis capital built the North Missouri Railroad, later called the St. Louis, Kansas City & Northern, and now the Wabash.

These roads were all due to the efforts of St. Louis men and St. Louis capital, and opened up a vast territory, whose richness has not yet been measured. They were all initiated in the early 50s, but St. Louis is continuing its work to the present time. In 1903, out of a total of over 5000 miles of railroad constructed in the United States, 2302 miles were built in the Southwest; that is, in the States of Missouri, Arkansas, Louisiana, Oklahoma, Indian Territory and Texas. In 1904 the total railroad building in the United States amounted to 3822.26 miles; in 1905 to 4358.2 miles, and in 1906 to 5023 miles, of which, in each year, at least 40 per cent. was in the States above named. About the same percentage of mileage is being constructed in the Southwest now. In all of this development St. Louis capital has been heavily interested. Among other recent roads made possible by St. Louis capital are the following: Arkansas Southern, running from Eldorado, Ark., to Alexander, La.; Blackwell, Enid & Southwestern, extending from Blackwell, Okla., to Vernon, Texas; Denver, Enid & Gulf, running from Guthrie, Okla., to Belvedere, Kans.; St. Louis, Brownsville & Mexico, constructed from Brownsville, Texas, toward San Antonio, Texas; St. Louis, El Reno & Western, extending from Guthrie west, and Missouri & Arkansas, running from Eureka Springs, Ark., east.

The Mexican Central, running from El Paso through the Republic of Mexico, while not in the territory called the Southwest in this article, still is in territory tributary, and should be mentioned, for St. Louis loaned quite a good deal of money to help its completion.

The reports of men becoming rich in a night by the discovery of the precious metals in Colorado, Nevada and Montana directed the tide of immigration to the Northwest, and so it continued from the Mexican War until about 25 years ago. Then attention was called to the heretofore neglected Southwest, and from that time it has been doubling its population every decade. Along the lines of railway made possible by St. Louis capital sites became villages, villages towns and towns cities almost before the echo of the first locomotive's whistle had died out across the plains. Indian reservations became things of the past, and fruit was grown which rivaled the products of Florida and California. The new cities, so overgrown as to be awkward in the frontier dress, needed help. Water-works, gas and electric lights, street railways, telephones and other such conveniences were necessary, but the communities were not strong enough to stand the inaugural expense. St. Louis had faith in their future, and readily gave her assistance, taking pleasure in playing the part of an elder sister intensely interested in the welfare of the younger children.

As an indication of the volume of business St. Louis has with the Southwest, the following figures are instructive: The total number of tons of freight shipped out of St. Louis in 1907 was 18,374,916; of this, 10,537,291 tons, or 57 per cent., was for the Southwest. The total number of tons of freight shipped in to St. Louis the same year was 29,445,669; of this, 15,146,725 tons, or 51 per cent., was from the Southwest.

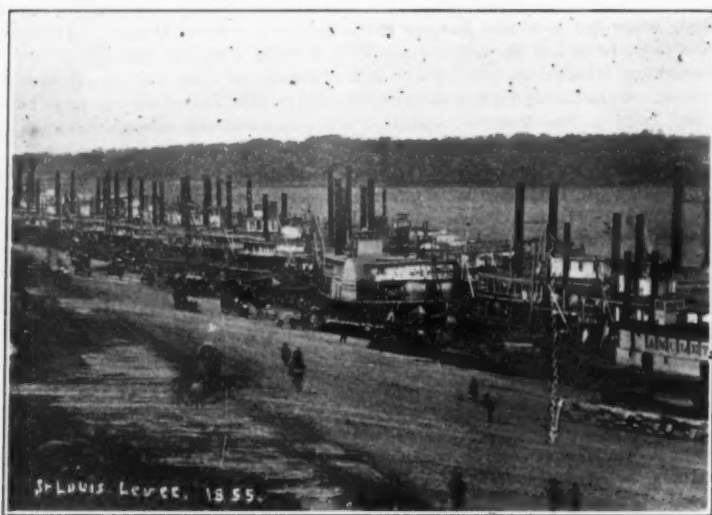
This section has always looked to the financial institutions of St. Louis, and has never found them unwilling to do all in their power. Every bank in Arkansas keeps an account with some St. Louis bank or trust company, and this can also be said of nearly every bank in the other Southwestern States. The great service that St. Louis performs with out-of-town banks, mostly located in the Southwest, is shown by the fact that between January 2 and October 31 of this year, a period of 10 months, the St. Louis banks and trust companies shipped \$104,412,729 in currency, gold and silver to their correspondents for the purpose of handling and moving crops and for other industrial and commercial purposes. During this same period they received \$67,681,979 in cash, making a total of \$172,094,704, which represents what St. Louis is doing as a financial center. When called on she can do much more, and the Southwest is assured of any financial accommodations it may need.

What St. Louis has done in the past, is doing in the present, she will continue to do in the future, even better as her own resources grow. The Southwest has changed from vast acres of unoccupied land, the wants of whose people were simple, to a territory of small farms and homes. The luxuries of the past are the necessities of the present, and St. Louis, as the big city of the Southwest, must be prepared to furnish

them. As was said in a speech in Oklahoma last June, the crying need of the Southwest is more railroads. It has been shown what St. Louis has done and is doing in building them; it has also been shown how she has gladly furnished and is furnishing the capital for the internal development of the cities themselves; and she is at all times prepared with capital, manufacturing establishments, distributing agents and railroads for any opportunity that presents itself.

At the close of business November 27, 1908, the associated banks and trust companies, publishing statements in response to the call of the Comptroller of the Currency and the manager of the Clearing-house, showed total capital, surplus and undivided profits of \$8,508,269.56; cash and exchange of \$117,408,013.87; total deposits of \$280,407,648.32; total loans and discounts of \$223,471,258.64; total surplus and profits of \$46,468,269.56, and total resources of \$382,947,603.98.

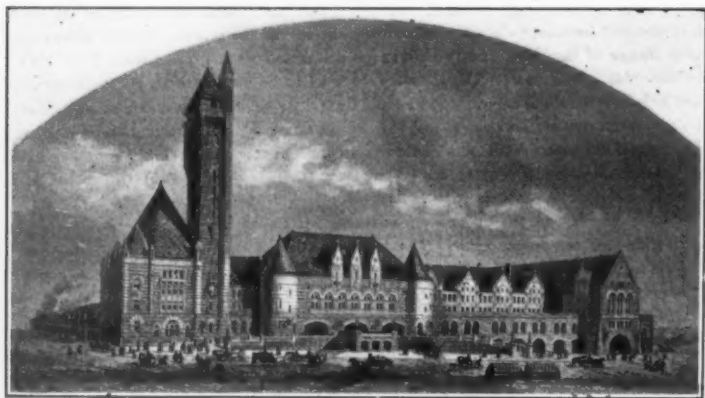
St. Louis has well earned the name for great financial strength. Her banks and trust companies stood the shock of 1893 without a failure, and our late panic was weathered without a break. She has not known a bank failure of any consequence since 1886, and estimated by 10-year periods, her bank clearings have increased more than 100 per cent. No year has shown a decrease since 1896, and in 1907 the clearings amounted to \$3,165,619,327, an increase of 6.10 per cent. over the previous year.



ST. LOUIS LEVEE IN 1855.

As a manufacturing center St. Louis ranks fourth in the United States. In 1907 there were 2724 factories, with capital of \$160,166,922, paying in wages \$62,030,485. Among these is the largest hardware house in the country; the largest shoe house in the world; the largest woodenware house in America; the largest drug house in the United States; the largest manufacturer of tobacco in the world; the largest brewery in the United States, and the city also holds first place in the manufacture of street and railroad cars and of stoves and ranges, and in the output of American-made chemicals. St. Louis, unlike some other large cities, is not limited by natural obstacles in its expansion. There is plenty of room, and any factory wishing to locate here can find a most satisfactory site, practically in view of coal fields, with an unlimited supply of coal, and on a belt railroad which will give it connections with all the lines of this great railroad center.

The wholesale houses of St. Louis are exceptionally well equipped distributing agencies. The largest dry goods market west of the Alleghenies, the largest hardwood lumber market in America, the largest horse and mule market in the world and the second



UNION STATION, ST. LOUIS.

largest millinery market in America are in this city. It is also the largest inland coffee distributing center and the largest distributor of shoes.

St. Louis is one of the greatest railroad centers of the United States; 26 roads, representing nearly all the great systems, enter the city, and quite a number of the general offices are located here. In addition to the railroads, it has the advantage of its location on the Mississippi River, and can send freight by water over it, the Missouri River, the Ohio, the Illinois and the Cumberland. The future holds the prospect of seeing the Mississippi so deepened that there will be a passage for ocean-going vessels to the Gulf, and when this becomes a reality not only St. Louis and the Southwest, but the entire Mississippi Valley will be greatly benefited.

St. Louis has a proprietary interest in the Southwest, but this does not blind her to

the fact that, due to the very transportation facilities she was so instrumental in installing, there are rivals in the field. However, she is energetically caring for her interests. One large wholesale dealer told the writer recently that he has over 150 men traveling in this territory; another, that his house has about 100. Both of these gentlemen said that when more railroads were built they would very materially increase their salesmen in this district. Of the fast-mail trains leaving St. Louis between 1.30 A. M. and 2.30 A. M. four go into the Southwest, reaching all sections of that territory, so that announcements made in the St. Louis morning papers can be read the same day by daylight in Shreveport, Dallas and other cities as far as 700 miles away. St. Louis is interested in the Southwest, the Southwest is in daily touch with St. Louis, and equipped as this metropolis now is, with her population, finances, manufactories and all other factors that go to make a great industrial center constantly increasing, she will continue her supremacy and at the same time prove herself the best friend and helper of the growing Southwest.

Oklahoma's Equipment for Material Progress.

By F. M. POSEGATE.

[Written for the Manufacturers' Record.]

For some time previous to the Presidential election the writer did not feel disposed to say anything to the MANUFACTURERS' RECORD touching matters in this State, for the very simple reason that public sentiment appeared to be so unsettled as to preclude a fair prognostication. Now it can be truthfully said that the star of progress and prosperity once more hovers, bright and glorious, over the latest and most wonderful State of the Union.

Hereafter it may be safely figured that Oklahoma will not be cursed with freak legislation, or even threats of the same. This being the case, why should not the State have prosperity, for no Commonwealth has greater or more diversified natural resources, and these resources are so equably distributed as to suggest the idea that the Great Ruler of the Universe designed to accommodate all classes of industry without close contact, conflict or unhealthy competition.

Oklahoma has coal, oil, gas, lead, zinc, clay in the several grades, shale, gypsum, sand in all varieties, timber sufficient for domestic use, salt, iron, and, the writer believes, gold, silver and copper in superabundant quantities in the Wichita Mountains.

The most astounding developments of her underground resources have been in oil and gas. In the former, from her fields, only slightly developed, the output is equal, if not greater, than that of any other section of equal area in the world. In gas, with her fields hardly touched, her output exceeds that of any State in the Union. Today her wells are producing 140,000,000,000 cubic feet, or 1,000,000,000 more than Pennsylvania, and this output is increasing every day. In the State there are three great proven up gas fields, the Hogshooter, Collinsville and Taneha, with the Osage Nation rapidly coming to the front. Development now in progress near McAlester indicates that a new gas field will be opened in that section more productive even than all others combined. In oil, the Glenn pool is now the greatest field in the State, but parties engaged in gas development in the vicinity of McAlester, from what they have already uncovered, are strongly of the opinion that a new oil source will be opened in that vicinity that will be second, if not ahead of the Glenn pool.

In zinc and lead the mines already opened near Miami bid fair to outstrip those of the famous Joplin district. Sporadic examples of iron are found in the Arbuckle Mountains, and hopeful leads of the same have been traced within 20 miles of McAlester. This town is almost the immediate center of the coal fields and, according to reports of the State Geologist, the bituminous deposits there are of first quality, and in quantity sufficient to supply the State for unnumbered years. Tulsa county has within her borders a superabundance of stone, shale, clay and sand, together with coal fields of broad extent. Ardmore is the center of the great asphalt beds, and with reference to them it is only necessary for me to reiterate what I have before said in the columns of the MANUFACTURERS' RECORD: Oklahoma has sufficient asphalt of the very best quality to pave the streets of every city in the United States, with enough left to pave the streets of every city of Europe, and possibly those of every other city of the civilized world.

In the matter of gypsum, the country between Watonga and Alva, contiguous to the Chicago, Rock Island & Pacific Railway, especially through the full length of Roman Nose Canon, is the seat of the chief deposit of that mineral. The manifold purposes to which this article is already adapted is a fair indication that it will at an early day take rank as one of the great assets of the State.

With reference to the cities of the Commonwealth, it is always in order, in view of the fact that she has no parallel of her age in the world, to speak of Oklahoma City. It is not too much to say that she leads, in point of population, up-to-date improvements, manufactures and volume of business, all other cities in the State, and the energy, perseverance, patriotism and broad-minded devotion of her citizens is a fair guarantee that she will continue to hold that proud position. Of the several other prominent cities in the State it would be invidious to speak, for many of them are close rivals, and more than one in time hopes to overtake and eventually supplant the great city. In this connection no one seeking a location for manufactories need hesitate to come to the new State, for at some point within her border can be found the crude material in superabundance, ready to be transformed into a finished product.

In an agricultural sense the State is IT par excellence. Her soil and climate are so diversified that it is possible to produce within her borders every article that can be grown in any of the zones save possibly the torrid. This season has been normal, and every crop save that of fruit has come to full fruition. Unfortunately, mildew prevailed to a very great extent throughout the State, and grapes specially suffered materially.

One great handicap in the Indian Territory part of the State has been the inability of the Indian to transfer his land. Practically all restrictions have been removed, and now the Indian cannot only sell his land, but make a first-class title.

Finally, the writer will woefully miss his guess if the progress of Oklahoma in all lines shall not far exceed in 1909 anything she has achieved during any three years of her previous experience.

Granite and Marble Resources of the South.

By ERNEST F. BURCHARD.

[Written for the Manufacturers' Record.]

Mr. Ernest F. Burchard is a member of the United States Geological Survey, in the service of which he has made reports on barytes, bauxite and aluminum, glass sand, gravel, gypsum and other mineral products.

A map representing the geographic distribution of granite and marble in the United States would show a greater total area underlain by these important structural and ornamental materials south of the latitude of Pennsylvania and Northern Colorado than north of that latitude. A chart indicating the value of granite and marble produced in the United States during the calendar year 1907 would show that the Southern States produced granite valued at about one-fourth of the total value for the country at large and about one-third of the production of marble. The relationships as regards production are brought out in the following table, based on figures published by the United States Geological Survey.*

Value of Granite and Marble Produced in the United States, 1907.

States.	Granite.	Marble.
Maine.....	\$2,146,420	
New Hampshire.....	647,721	
Vermont.....	2,693,889	\$4,596,724
Massachusetts.....	2,328,777	212,438
Rhode Island.....	674,148	
Connecticut.....	591,153	
New York.....	289,722	911,951
Pennsylvania.....	366,679	118,539
New Jersey.....	75,757	
Delaware.....	158,192	
Wisconsin.....	1,228,863	
Minnesota.....	546,603	
South Dakota.....	690	
Montana.....	130,050	
Wyoming.....	90	
Idaho.....	25,942	12,500
Washington.....	562,352	
Oregon.....	117,625	
Utah.....	5,240	2,500
Missouri.....	136,405	
Oklahoma.....	24,550	16,805
Colorado.....	67,134	
New Mexico.....	167,294	7,535
Arizona.....	13,700	
California.....	1,306,324	183,285
Southern States.		
Maryland.....	1,183,753	98,918
Virginia.....	389,426	
North Carolina.....	889,976	
South Carolina.....	129,377	
Tennessee.....		688,148
Kentucky.....		12,500
Georgia.....	858,603	864,757
Alabama.....		86,475
Arkansas.....	168,996	
Texas.....	122,158	
Southern States total.....	\$3,742,289	\$1,749,798
Grand total.....	18,057,600	7,812,075

Further analysis of the figures in the table shows that the New England States and Wisconsin produced granite to the value of more than \$10,000,000, or five-ninths of the grand total. Nearly \$6,000,000 worth of marble was produced in the three States of Vermont, Massachusetts and New York, leaving only about one-fourth of the total to be produced by all the other States together.

The present trade conditions are, of course, very easily explained. The proximity of the populous New England and seaboard cities to the New England granite and marble areas has been responsible in a large measure for the great development of the quarrying industry in that section of the country. From central Connecticut to the Bay of Fundy granites form most of the coast line. This coast line is bold and rugged, with many hundreds of small fiords, which afford shelter and sufficiently deep water for schooners built for the stone-carrying trade. Cliffs of granite rising from the water are converted on the spot into dimension stone, which is loaded directly into boats bound for Boston, New York and Philadelphia. The marble areas of Vermont, Massachusetts and New York, while not so favorably situated with regard to water transportation, are nevertheless easily accessible by transportation routes and relatively near the large markets. With the growth of the New England granite and marble industries and the consequent lowering of the cost of production came the natural extension of the markets, so that today Maine granite and Vermont marble are sold in Mississippi Valley States, and even on the Pacific Coast, in competition with local products. Whether the granite and marble industries of any other section of the country will attain a degree of development corresponding to that of the New England States will depend in general upon the quality and quantity of available materials, upon topographic and other physical conditions affecting quarrying, upon their location with respect to transportation routes and markets, and also in large part upon the appreciation by business men of the possibilities of the situation.

It shall be the purpose of the remainder of this paper to indicate in a general way, by means of scattered references, the wide distribution and general excellence of the granite and marble deposits in the Southern States. The writer is indebted to Dr. Geo. P. Merrill, Curator of Geology, United States National Museum, for many of the facts presented herewith.†

The granites and other crystalline siliceous rocks in the Southern States may be grouped into three broad areas, viz., the Appalachian area, the Mississippi Valley area and the Texas area.

Appalachian Area.—A broad belt of crystalline siliceous rocks, mainly granites and gneisses, extends from Southeastern Pennsylvania southwestward across Maryland, Virginia, North Carolina, South Carolina and Georgia, its outcrop terminating in Eastern Alabama. This belt forms the Piedmont plateau. Its eastern boundary passes through the cities of Philadelphia, Baltimore, Washington, Richmond, Raleigh and Augusta. Its width ranges from 50 to 175 miles, and its length is more than 800 miles.

In Maryland there is an abundance of good material within easy reach of Baltimore. A medium-grained, dark-gray granite is quarried in Baltimore county near Woodstock. A finer-grained, light-gray granite of very pleasing appearance occurs at Guilford, Howard county. At Port Deposit, on Susquehanna River, is quarried a light bluish-gray gneissoid granite. This material is situated on tidewater, which gives it exceptional shipping facilities. A dark-gray gneiss is quarried for local use in Balti-

more, and a dark-blue gneiss is quarried at several points within the District of Columbia for use in paving and concrete construction.

Quarriable granite outcrops in Virginia along James River, and in the vicinity of Richmond. The granites of this State are mostly fine-grained, light-gray biotite granites, very similar to those of New England. Quarries near Richmond produce a massive gray granite that is sold throughout the South and middle West. The State, War and Navy Building in Washington, the most elaborate granite structure in the United States, is built of Virginia granite. Large quarries of bluish-gray gneiss are operated on Potomac River opposite Washington to supply the city with crushed stone and paving blocks.

A granite suitable for ornamental work occurs at Milans Gap, Madison county. The material is reported to consist of quartz, dull-red feldspar and dull-green epidote, the effect of which in either rock-faced or polished work should be pleasing.

In North Carolina the two most important areas of granite are (1) that of Mt. Airy, in Surry county, and (2) that of the Dunn Mountain region, in Rowan county. At the first-mentioned locality an area of about 40 acres of rock is bare on the hillside, which rises 128 feet above the railroad track. The stone is of medium texture, light gray in color, and has an excellent rift and grain. In locality 2 both light-gray and pink varieties of granite occur. The postoffice building at Raleigh is built of the Dunn Mountain gray granite. There are many other occurrences of grayish biotite granite comparable to that on the coast of Maine, notably in Forsyth county, near Winston-Salem, and near Greensborough, Guilford county. Merrill has called attention to a peculiar variety of granite that may prove of value for ornamental purposes. It occurs at Cooleemee, Davie county, and is composed of rounded, radiating masses of green augite an inch or more in diameter, embedded in a ground mass of white or pink quartz and feldspar.

The supply of granite in South Carolina is abundant, although but little more is produced than is needed locally. In Fairfield county, near Winnsboro, are quarries in fine-grained gray granite fully up to the standard of the market. Near Columbia, Richland county, an excellent light-gray stone was obtained, from which was built the State Capitol. Good showings of stone are reported from Newberry, Lexington, Edgefield and Aiken counties.

Little or no granite is as yet produced on a commercial scale in Tennessee. The areas in which granite outcrops are situated lie along the Tennessee-North Carolina line in rather inaccessible places along the Great Smoky and Unaka mountains. A handsome coarse greenish epidotic granite, with large porphyritic crystals of red orthoclase, occurs on Bench Mountain, in Cocke county.

Knowledge concerning the granite resources of Georgia has been disseminated in a report on the granites and gneisses of Georgia by Prof. Thomas Watson. In DeKalb county are two well-known areas of granite, viz., Stone Mountain and Lithonia. Stone Mountain is an enormous granitic mass several miles in circumference and about 700 feet higher than the surrounding country. This rock has been quarried for half a century, and of late developments have assumed large proportions. The Stone Mountain granite is moderately fine-grained, of light-gray shade, and contains both muscovite and biotite. It occurs in sheets that become thicker with depth, so that blocks of almost any size desired can be obtained. A two-inch cube of this granite showed under compressive test a strength of 13,000 pounds per square inch. The rock at Lithonia is finer-grained, darker in color, and stronger than that of Stone Mountain. The Lithonia granite supported 18,000 pounds pressure per square inch. In Northeast Georgia, Elbert and Ogelthorpe counties are traversed by two belts of granite; one is a fine-grained, dark blue-gray stone, the other a medium-grained, light-gray rock. Both are of uniform texture and composition. The darker stone is suitable for monumental work, and the lighter one for structural material.

As stated above, the Southern Appalachian granite belt extends into east central Alabama. There are vast quantities of valuable stone still awaiting development in this State, although no attempts have yet been made to establish quarries on an important scale.

Mississippi Valley.—Areas of granite rocks in Missouri, Arkansas and Oklahoma constitute this division of the field.

In Southeast Missouri there are inexhaustible quantities of granite. These rocks underlie areas approximating 150 square miles in each of Madison and St. Francois counties, and smaller areas in Iron, St. Genevieve and Wayne counties. One of the most attractive of the Missouri granites is a coarse, red variety, quarried at Graniteville, Iron county, and Syenite, St. Francois county. This material yields blocks of almost any size desired. It has been extensively used in St. Louis and Chicago structures. In the latter city in a building in the wholesale district the window sills consist of single rough blocks of this granite 3 feet square by 17½ feet long, weighing about 10 tons each. An office building, also in Chicago, is embellished with 10 polished columns 18 feet high by 4½ feet in diameter, weighing about 18 tons each. The Allen monument in St. Louis, also cut from this granite, is 42 feet in height by 4½ feet square at the base, and weighs 45 tons.

Granites of various other colors, such as various shades of gray, are also found in the Missouri granite areas.

There is in Arkansas a total area of about 14 square miles of igneous rock exposed within the boundaries of the State. The value of these rocks for building and paving purposes gives them great economic importance. The rocks are not true granites, but may be classed under the general term "syenites." The syenites occur in four areas, viz., Fourche Mountain, Pulaski county; in Saline county, at Magnet Cove, and at Potash Sulphur Springs. The Fourche Mountain rock is known as "blue granite," or Pulaskite. It is used extensively for structural purposes, monumental work and for paving. This rock is very hard, and has shown one of the highest crushing strengths yet recorded for granite, viz., 34,950 pounds per square inch, with an average of 30,900 pounds.

Texas.—The important granite area in Texas is in Burnet, Llano and Gillespie counties. Here both red and gray granites of coarse and fine textures occur. A medium-to-coarse-grained pink granite is quarried on a large scale at Granite Mountain, Burnet county. The State Capitol at Austin is constructed of rock from this quarry, which furnished also the crushed stone for the concrete seawall at Galveston.

The marble areas in the Southern States follow in a general way the same grouping as the granite areas. Owing to the fact that most marbles have been formed by the metamorphism of limestone or dolomite under the influence of heat and pressure induced by intrusions or flows of molten rock, those beds of calcareous sedimentary rocks that

*Mineral Resources of the United States.

†Merrill, G. P., *Stones for Building and Decoration*. John Wiley & Sons, New York.

occur in the vicinity of granites and gneisses, and are older than the igneous material, have been changed almost invariably to a crystalline, granular condition. Thus it is that flanking the Appalachian granitic belt on the northwest there is from Southern Pennsylvania southwest to Central Alabama a belt of crystalline limestone or marble. This belt is narrower than the granitic belt, because it represents the upturned edges of beds of rock that dip away from the Appalachian axis and are buried beneath younger rocks to the northwest. Not all the marbles of commerce are metamorphosed rocks, however. Some limestones found in East Tennessee and in the Mississippi Basin, remote from areas of igneous rock, are nevertheless so completely and uniformly crystalline that the stone is capable of taking a good polish and of being used as a structural marble; hence in a commercial classification such stone is properly termed marble.

Appalachian Area.—The marbles of Maryland have been demonstrated to be of considerable economic importance, and there is a large annual production, the value for 1907 being nearly \$100,000. The marble belt is only 12 to 20 miles north of Baltimore. Extensive quarries are operated at Cockeysville, Baltimore county, where a white, medium-grained dolomite marble is obtained. Blocks large enough for ordinary construction work are easily obtained here, and some 26-foot monoliths used in the Capitol at Washington were obtained from this locality. The stone used in the lower 150 feet of the Washington monument in the latter city was obtained at Texas, Md. Variegated marbles occur in Carroll and Frederick counties, and serpentine or verd antique marbles are found in Harford, Baltimore and Montgomery counties.

The central portion of the Valley of Virginia is underlain by limestones which are considered capable of yielding good marbles in many places. According to Rogers' report on the geology of the Virginias, the special varieties mentioned are dun-colored, mottled blue, gray, white, red and shaded marbles. Beds having the quality of statuary marble are reported from Tye River and from Goose Creek, in Loudoun county, and from the latter locality also a beautiful green or verd antique marble.

There was no production of marble reported from Virginia in 1907, but the possibilities for the industry in this State seem to be very promising.

Marble is as yet not produced on an important scale in either North Carolina or South Carolina. In these States, however, especially in North Carolina, extensive deposits of good marble have been located by the work of State and Federal geological surveys. White, gray and pink marble, part of which is dolomitic, occur extensively in Swain, Cherokee, McDowell and Macon counties, North Carolina. While a good deal of the marble has been too much fractured by the folding and general uplift of the rocks of the region to be suitable for building and ornamental purposes, careful exploration has revealed a number of deposits of economic importance.

Georgia at present produces the greatest quantity of marble of any Southern State. The marble deposits of Georgia cross the northwest corner of the State, through Fannin, Gilmer, Pickens and Cherokee counties. The beds are comparatively thin, and intercalated with beds of gneiss and mica schist. In Fannin county the marble is fine-grained, white to gray in color, and in places banded with black. In Pickens county, where the greatest development has taken place, the marble is coarse, but even-grained, and of colors similar to those in Fannin county. The marble is quarried from hillsides and from deep pits. Not all the product can be utilized, owing to the jointed and gashed condition of the stone in many places. Surface decay along these joints and along bedding planes so corrodes the rock that surface indications as to the real value of the rock below are often misleading. Serpentine, or verd antique marble, is quarried near Holly Springs, Cherokee county, and occurs at other points. It is used for interior decorative work. Georgia marble is shipped extensively to distant points. The State Capitol at Providence, R. I., and the Corcoran Art Gallery in Washington, D. C., are constructed of this material, as well as hundreds of other costly buildings throughout the United States, some of them being in the heart of other marble-producing localities.

Beautifully-colored and veined marbles occur in Alabama, as well as white and black marbles. Both the crystalline and non-crystalline varieties are represented. The most notable occurrences of crystalline marble are in Shelby and Talladega counties, the latter county being the site of extensive quarries. The beautiful interior of the Day and Night Bank in New York city is decorated with polished work and carved ornaments and statuary cut from this celebrated Alabama white marble. Limestone of variegated colors, comparing favorably with East Tennessee marbles, is found along Cahaba River in Bibb county.

Extensive deposits of light-colored marble as yet but little developed are reported to occur along Coosa River, in Chilton county; also in Clay county and in Lee county.

Next to Georgia, more marble is produced in Tennessee than in any other Southern State. The marbles of East Tennessee are famous for their variety of colors, for the peculiar effects produced by the fossil contents of certain beds, and for the high polish they are capable of receiving and retaining. The fossiliferous chocolate marble was formerly regarded as typical of Tennessee marbles, but in recent years gray and pink granular varieties have been quarried extensively. Marble is known to occur in 15 or more of the counties in East Tennessee, and in a half-dozen or more counties in both Middle and West Tennessee.

Mississippi Valley.—In the States of Missouri, Arkansas and Oklahoma, on the flanks of the Ozark uplift, there are known to occur beds of colored crystalline limestone equal in quality to the variegated varieties of Tennessee marble. Important localities in Southeast Missouri are near Fredericktown and Cape Girardeau. Large quarries are in operation at Carthage, Mo., developing a grayish marble of great durability. Along White River, in Northwest Arkansas, are bluffs in which beds of similar marble are exposed, and since a railroad has been built recently through this region there is a possibility that some of these marbles may be worked.

Texas.—Bluish limestones of Ordovician age, outcropping in Burnet county at Marble Falls, are of a dense, sub-crystalline character, and will doubtless take a good polish. Some of the cretaceous limestones of the State are entirely crystalline, and well fitted for interior decorative work. Such stones occur in San Saba county. White and black marbles occur in Brewster county, and marbles of other varieties are reported to occur in Burnet, Llano and El Paso counties. Analyses and tests made on several Texas building stones showed that the materials in Brewster and San Saba counties were nearly pure lime carbonate, and capable of sustaining compression of more than 10,000 pounds per square inch.

It has been impossible in the space allotted to this article to deal particularly with the feasibility of further commercial development of the marble deposits shown to be

so widespread and abundant in the Southern United States. Only three of these States produce more than enough granite to supply local demands; only three or four produce more than each needs of marble, while the majority have to import much of the granite and marble required. The Southern Appalachian granite and marble areas are from 100 to 300 miles nearer to Chicago and to the great Mississippi Valley markets than the New England areas, and the Colorado and Texas areas are centrally located with respect to the middle West. Wisconsin granite supplies a large part of the Chicago and Northern Mississippi Valley markets, but it is doubtful whether Wisconsin quarries can be operated throughout the year, while those in lower latitudes have no such climatic conditions to contend with.

In the Southern States, south of the limit of glaciation, the surface rocks have been subjected to long-continued decay and disintegration. Erosion has not removed this residual material rapidly enough to expose fresh rock, and in the absence of glaciation, which in the North has planed from the rock surface the accumulations of past ages of disintegrated rock, the granites and marbles here considered are for the most part badly weathered at the surface or else are in many places buried under residual soil and debris. This fact has hindered quarrying in two ways; first, by obscuring rock outcrops, and thereby preventing discovery of good deposits, and second, by rendering the rocks, where visible, of unsound and unattractive appearance. If these facts are given due consideration in prospecting, early discouragements may be overcome and deposits of unexpected value are very apt to be uncovered.

GOOD ROADS IN THE SOUTH.

By JOSEPH HYDE PRATT, State Geologist of North Carolina.

[Written for the Manufacturers' Record.]

When railroading was first begun in this country many persons had the idea that there would be but little use for the public road in those sections of the country that were traversed by the railroad. Time has demonstrated, however, that the railroads are simply the main arteries of travel, and public roads are the veins, each being a necessary part of the other in our system of transportation, and that without the public roads the railroads would fail in accomplishing what is required and demanded of them.

Agricultural products are a vital necessity of every country and must be provided, no matter what else has to be given up. The magnitude of their production in the South is hardly equaled either in value or in tonnage by the products of any other industry. Nearly all agricultural products have to be carried for at least a small distance over our public roads. The cost of this transportation has to be deducted from the value of the agricultural product to the farmer who produces it.

Improvements in railway transportation facilities are approaching a high state of efficiency, while the public highways have in many States been greatly neglected. The people are, however, now turning their attention to the question of the improvement of public roads, and, although this awakening has come rather late, yet our people will attack it with the same force and vigor that they have taken up other questions of vital importance to the State and to the nation.

This question of improved public roads is not confined to the South, but is a question still confronting the whole nation. It has, however, been taken up more generally in other sections of the country than in the Southeastern States. In nearly all of these States a certain number of miles of improved public roads have been made, which have demonstrated their value to the community and to the State and have shown conclusively that they are the means of saving many dollars a year to the farmer. Over many public roads of the South it is not possible for a farmer to haul over half a ton. If he is not over eight miles from a railroad, his team can make a round-trip in a day if the roads are not too muddy. If his team is worth \$2.50 per day, it has cost him at the rate of 62½ cents per ton for each mile. On the railroad it can be shipped to almost any point that the farmer desires at one-fiftieth to one-hundredth of the rate which he has paid to bring it to the railroad. This is because the science of transportation has been highly developed in connection with the railroad and almost entirely undeveloped in connection with the public road.

As public-road improvement goes on, he finds that he can begin to haul from two to four times as much per load in one-fourth to one-half the time, thus reducing the cost per ton per mile from one-fourth to three-fourths the cost of what it was over the poor road. There is but little chance of reducing the railway transportation charge on agricultural products, but there is a splendid opportunity in nearly every section of the South for reducing the cost of the public-road transportation charge on these products.

There are in the Southeastern States approximately 518,830 miles of public roads. In the following table the mileage is given by States, together with the miles of public roads per square mile of area and the population per mile of road:

State.	Population.*	Area in square miles.	Miles of public roads.		
			Total mileage.	Miles of road per sq. mi. of area.	Population per mile of road.
Alabama.....	2,250,000	51,998	50,089	0.97	44
Florida.....	650,000	58,666	17,374	0.34	26
Georgia.....	2,600,000	59,265	57,203	0.96	45
Louisiana.....	1,700,000	48,506	24,897	0.54	68
Maryland.....	1,441,000	12,327	16,773	1.70	86
Mississippi.....	1,750,000	46,865	28,636	0.63	45
North Carolina.....	2,100,000	52,426	49,763	1.00	42
South Carolina.....	1,475,000	30,989	41,830	1.30	35
Tennessee.....	2,230,000	42,022	48,982	1.17	45
Texas.....	3,600,000	265,896	121,409	0.46	29
Virginia.....	2,045,000	42,627	51,812	1.29	39
*Estimated for 1908.			518,830		

Of this 518,830 miles of public roads in these States but a very small per cent. would come under the head of improved roads. Most of them are in about the same condition as they were 10 years ago, or even soon after they were constructed. At the time of locating the road little thought was given to grade or surfacing material necessary to make a smooth, hard road. About 15 years ago the good-roads movement began to spread over the South, but it was not until 10 years ago that a general interest was aroused for good roads. The first five years was largely a period of education, but, beginning in 1898, the movement took more definite form and the actual construction of improved roads began. This movement has steadily gathered strength, until now all

the Southern States are very much interested in the subject, as is evidenced by the numerous good-roads meetings, conventions and congresses that have been held in the different States during the past few years, culminating in the Good Roads Congress, held at Greensboro, N. C., October 13 and 14, 1908, and the Southeastern Good Roads Congress, held in Atlanta, Ga., December 3 and 4 of the same year.

At these two congresses representative men from many of the Southern States were present and testified to their belief that the industrial advancement of the South is largely dependent upon a system of good roads being constructed through the several Southern States; and they also advocated State aid to counties in the construction of improved roads.

In considering an improved road* one is meant that has been properly graded and drained and which has been surfaced with some material or combination of materials, or to which some preparation has been applied resulting in a reasonably smooth, firm and durable surface. As illustrative of these various types of road, macadam or gravel roads may be cited as examples of hard materials; sand-clay or tar-macadam as applications of combinations of materials; while the use of oil would illustrate the improvement of a road by the application of a preparation.

While some States are more advantageously situated than others in regard to the materials suitable for use in the construction of good roads, are rather more thickly populated and have a greater value of taxable property per mile of road, yet in every State a considerable advance can be made in the construction of improved roads. Each State has certain difficulties to overcome in relation to the good-roads problem, and these conditions, as they exist, should be faced fairly. In North Carolina, with approximately 50,000 miles of public roads and a population of 2,100,000, its taxable property is only about \$350,000,000; while the State of New Jersey, with taxable property of about \$1,000,000,000 and a population of 2,294,000, has only about 20,000 miles of public roads. Thus, by comparison, it can readily be seen that New Jersey is in much better condition financially to construct improved roads than North Carolina. As far as road materials are concerned, certain portions of North Carolina are as well supplied as New Jersey. With North Carolina's much larger area and number of miles of public road, the percentage of improved roads that could be constructed each year would be much smaller, although the actual number of miles constructed might be approximately the same.

If a comparison were made of the percentage of improved roads with the population per mile of road it would be observed that those States which have the highest percentage of improved roads also have the largest population per mile of road, and it is undoubtedly a fact that improved roads will invariably lead to an increase in population.

In determining the practicability and feasibility of constructing improved roads and the kind of road, certain important conditions must be considered: (1) Availability of suitable roadbuilding material; (2) estimated amount of traffic over the road; (3) wealth of the county or section of the State which has to pay for the road.

The cost of road materials will vary very greatly in the different Southern States and in different portions of the same State, so that it is often necessary to use one form of improved road in one State and another in another. Where the traffic is so heavy that it is necessary to construct a macadam road a great variation will be noticed in the cost per mile of the macadam road in one State as compared with another, on account of the inaccessibility of macadam material in the one State and its nearness to the road constructed in the other. In illustrating this point, Mississippi and Tennessee offer a good comparison. These two States in 1904 expended in money and labor about the same amount, yet, because Mississippi is very poorly supplied with road-surfacing materials, they were only able to improve .38 of 1 per cent. of its roads; while Tennessee, with about 10,000 more miles of public roads than Mississippi, was able, with the same amount, to improve 8.74 per cent. of its roads.

Notwithstanding the difference in wealth and accessibility of road materials, no State should plead its poverty as a reason for not improving its roads. Any tax that is levied for the construction of roads represents a permanent investment in the State and one which will result in a still greater income to the State than could possibly be derived from the same section without the improved roads.

The four types of good roads that are being constructed in the South are macadam, gravel, sand-clay and burnt-clay. Of these four types of road the macadam is, of course, the most desirable; but in many sections of these States, especially in the coastal-plain region, this type of road is impracticable, except in very limited areas, on account of the excessive cost of materials suitable for macadam. In some of the extreme Southern States, as Louisiana and Mississippi, the cost of macadam is extremely high, and it will only be possible to surface a comparatively few miles of road in this way.

The surfacing material for macadam varies very widely, according to the section of country in which the road is being constructed. Thus, in Tennessee and Kentucky a great deal of the surfacing material for macadam is limestone, while in certain portions of Eastern North Carolina, South Carolina and in Florida the surfacing material is a shell rock or coral rock. In other sections of the Southern States granite is very abundant and is used very extensively for macadam. The best rocks for surfacing the macadam are the so-called trap rocks, especially diabase. This rock is found in limited areas in a few of the Southern States.

Where the traffic over the road is not too heavy a gravel road, when well constructed and drained, makes a good-surfaced road. It is often feasible and practicable to construct a macadam road close to the town or city, and as the road extends farther and farther away, to have the farthest portions constructed of gravel, as the traffic becomes lighter the farther away from the town.

In certain sections of the Southern States it has been found for the present impracticable to build the public roads in the country of either macadam or gravel, and resource has been made to a combination of sand and clay, making what is now known as a sand-clay road. The first State to utilize this form of road was South Carolina, and Richland county was the pioneer county to improve its roads by a mixture of sand and clay. This form of road proved so successful and economical that this county now has over 250 miles of sand-clay roads.

While a sand-clay road is supposedly simply a mixture of one part clay and two parts sand, yet considerable skill is required in the mixing of this if the best results

are to be obtained. In a number of instances counties have attempted the construction of sand-clay roads and become very much dissatisfied with them, the trouble being that sufficient care was not exercised in the construction of the road.

Burnt-clay roads, which consist in surfacing a road with lumps of clay that have been subjected to intense heat and partially burned or baked similarly in color and durability to a brick. A road surfaced with this material makes a fairly good form of road. This has been tried in Mississippi with fairly good results. Material similar to this was used at St. Louis during the Louisiana Purchase Exposition for surfacing their sidewalks.

As stated above, there are in the Southern States 518,830 miles of public roads, and in each State a certain number of miles of these public roads have been improved by utilizing one or more of the types of surfacing mentioned above. The total amount of improved roads are 18,490 miles, and there is given in the following table the number of miles of each type of improved road that has been constructed:

State.	Miles of improved road.*			Total mileage of improved roads.	Total miles of roads.
	Surfaced with stone.	Surfaced with gravel.	Surfaced with other materials.		
Alabama.....	435	1400	75	1,900	50,089
Florida.....	390	30	800	1,010	17,374
Georgia.....	500	750	650	1,900	57,203
Louisiana.....	50	50	20	120	24,887
Maryland.....	1000	500	200	1,800	16,773
Mississippi.....	125	50	50	225	28,698
North Carolina.....	400	490	475	1,365	49,763
South Carolina.....	100	200	1700	2,000	41,830
Tennessee.....	1800	2575	...	4,375	48,982
Texas.....	1950	190	55	2,195	121,409
Virginia.....	800	750	150	1,700	51,812
Total.....	7365	7669	4975	18,490	618,830

*Estimated.

The old method of obtaining revenue for the construction of roads was by levying a labor tax, which required all able-bodied male residents of a State between certain ages to work on the public highways within their respective townships for a certain number of days per annum; but in lieu of this labor they could pay a certain amount for each day that they were required to work. While thousands of miles of public roads have been built by this means, there are but few miles of graded or improved roads constructed, and it is practically impossible to construct a system of good roads in this way. Many of the States soon began to realize this, and, while few of them have passed any State law requiring a direct tax on the \$100 worth of property for use in the maintenance of roads and bridges, yet in nearly every Southern State laws have been passed that permit the counties to make a direct tax for raising revenue for the construction of roads.

The next step of the good-roads movement has been the issuing of bonds for the construction of improved roads, which makes available at once sufficient funds for the construction of many miles of macadam or other surfaced roads. While, as far as I know, none of the States have issued bonds for the construction of roads, many counties in most of the Southern States have issued bonds for the construction of good roads, and those counties which have begun the construction of good roads by revenue raised from bonds have continued this work on a larger scale each year.

While the issuing of bonds has been a step forward, there is still another step that should be taken by the States, and that is in State aid to counties in the construction of good roads and the establishment in the State of a highway commission, which would have general supervision of all the roads throughout the State. Maryland has already begun this work, the Legislature appropriating \$200,000 annually for improved road construction under the supervision of a highway commission, and providing at its last session for an issue of \$5,000,000 of bonds for the purpose.

In Virginia a highway commission was created a little over two years ago, but only a small amount was at their disposal for actual assistance in the construction of the State's roads, and a large part of their work was creating a sentiment in favor of good roads. Their good work resulted in the last Legislature appropriating \$250,000 for improved road work in the State.

North Carolina will ask the Legislature which convenes in 1909 to pass a highway commission bill and to appropriate a certain amount for State aid to counties in the construction of improved roads. In Georgia the interest in this same movement for State aid to counties and the creation of a highway commission is gathering strength, and it is very probable that at their next Legislature a bill will be introduced for the creation of a highway commission, with an appropriation for State aid to counties.

Although the results of these different steps in the progressive movement toward the construction of improved roads in the Southern States have been the means of the actual construction of many miles of improved roads, yet on account of the size of the States and the number of miles of road it seems sometimes as though the progress was extremely small and the final outlook discouraging. Nevertheless, those who are interested in the good-roads movement and have kept in close touch with the different advances that have been made during the past 10 years are very much encouraged and realize that the good-roads movement is a permanent one and is bound to gather strength each year, with the result that there will constantly be made each year larger and larger appropriations for the construction of good roads.

There are two counties that stand out very prominently in improved road work, and the results accomplished in these counties have been the means of creating an interest and enthusiasm in many other counties for improved roads. These are Mecklenburg county, in North Carolina, and Fulton county, Georgia. In these counties the improved road work has been pushed very rapidly and these counties are reaping the benefits of good roads in increased wealth and school facilities.

After the construction of an improved road the roadsides should be cared for, if a good impression is to be given to those who travel over the road. All rubbish should be removed and old excavations filled up. Where possible and practicable, ornamental or shade trees should be planted, and especially in the Southern States they are a considerable factor in reducing the cost of maintenance of a macadam road. They should not, however, be planted too thick, so as to prevent all sun from reaching the road. On dirt roads, however, the shade tree should be eliminated as far as possible on account of it being very necessary that the sun's rays should have access to the road to keep it thoroughly dried out.

No matter what character of road has been constructed, it will constantly need repair, and funds should be provided by every State and county for the maintenance of its improved roads. With some the expense for a number of years will be very

*See Bull. 32, Office of Public Roads, U. S. Dept. of Agriculture, page 6.

slight, but they should be examined each year, and where any repairs are necessary these should be looked after.

One of the greatest agencies in creating a healthy interest in improved roads has been the construction of experimental and object-lesson roads by the Office of Public Roads of the United States Department of Agriculture. This department has been able to build object-lesson roads in nearly every Southern State, and the letters received at the office of the department have shown that in many instances these roads have been the cause of the county making special efforts to construct a system of good roads within its borders.

Those who most appreciate good roads are those who live in communities where there are good roads.

Improvement in Character of Southern Buildings.

By MICHAEL HEISTER.

[Written for the Manufacturers' Record.]

Mr. Michael Heister is vice-president of the firm of Milburn, Heister & Co. of Washington, D. C., formerly Frank P. Milburn & Co., which has had wide experience during many years in various lines of Southern architecture.

It is with much pleasure that we respond to your request for an article covering the tendency of the South to improved building operations, because it is most gratifying to us to have noted this tendency during the past several years. As our energy for a number of years has been directed almost entirely toward the South, and being somewhat familiar with all sections of this country, as we have done business in almost every Southern State, we do not hesitate to assert that there is and is going to be a vast improvement in the character of buildings over those that formerly prevailed. We are optimists regarding the South in the fullest sense, and, while this growing country has developed at a great rate, it is our opinion that it will grow at a greater rate—in fact, experience a great growth within not many years to come. With its industrial progress in recent years, its valuable natural resources, its great promise of the future, when one considers the vast deposits of coal, iron, marble, granite, timber lands and water-power, in addition to the natural resources of the soil and climate, we cannot help believe that if the Southern lawmakers are not too stringent and will show a liberal attitude toward the railroads and capital, unlimited capital will flow through all the veins and arteries of the entire Southern country, thereby making the development of the natural resources possible, with the inevitable result of improved building operations. However, the people of the South cannot sit idly by and expect these things to transpire without a display of energy on their part, and it will be largely up to them whether or not the country will develop as fast as it ought during the coming years. We believe, however, that the people of the South, especially the younger element, are fully cognizant of the part that is expected of them, which is shown by the numerous boards of trade, chambers of commerce and similar organizations that have sprung up in almost every Southern city of any consequence, advertising to the world at large the resources and advantages of their particular section.

One of the hopeful indications from the public generally is, what we believe, a tendency to a better appreciation of what is good and pure in buildings, both in design and construction, and where formerly size and flash appealed to the average client, the public seems to have a better understanding of the principles as applied to building, with the result that the client of today prefers a structure less pretentious than formerly, but embodying better material and improved methods of construction, and also has a better appreciation of simplicity and logic in design. I will recall my surprise when I became associated with Mr. Milburn, almost eight years ago, at the very small appropriations that were generally made for public buildings and the immense size the buildings were to be for the amounts appropriated, which in every instance were from 20 to 40 per cent. less than what they ought to have been, with the result that the character of the work was necessarily of an inferior grade on account of the demands being greater than the allowance could satisfactorily cover.

I think, however, that this condition was largely the result of the practices of a certain class of architects, and I might add that progress at present is retarded to a certain extent by this same class of architects with whom we are sometimes forced to compete, because in their eagerness to secure a commission they make all kinds of impossible promises, which result in an inferior building and a disgruntled client.

It has, however, been our good fortune during the past several years to secure most of our work without competition, which has proved very satisfactory not only to ourselves, but to our clients as well, because we have an opportunity to confer with them in detail before they fully decide what they want, and we usually find them very responsive, and that there is a decided tendency on their part for the better things in buildings when we point out to them the advantage of so doing. I might relate one case which will cover our meaning. We recently completed in one of the larger Southern cities a sanitarium building, the plans and specifications for which we were commissioned to prepare without competition. The officials in charge submitted to us suggestions of what they thought they wanted in the arrangement of the different rooms; also that they wanted to spend about one-half the amount they did spend, and that they had an idea of erecting the building with mill construction, something entirely at variance with all authorities on hospital construction. We then began using our persuasive powers and pointed out the advantages of doing one thing over another, and as the gentlemen in charge were broadminded and farsighted, they readily appreciated the advantages of embodying the latest methods of construction pertaining to that class of buildings when brought to their attention, with the result that they did not hesitate to spend almost double the amount they originally intended to spend, because they now have a building that is fireproof, thoroughly sanitary in every particular, equipped with the most modern apparatus, and as complete in its appointments as any building of its size and character that can be found anywhere, and we have a well-satisfied client. I cite this instance to illustrate the tendency as we now find it, and we experience very little trouble in convincing our clients of the wisdom of building well, and believe that other architects find the conditions similarly so.

It is our opinion that the tendency to improved building operations in the South is largely the result of the increased number of Southern people who now take trips to the larger cities of the North, and who in this way get a better understanding and

appreciation of the building operations as are now carried on in these financial centers, and if it were in our power we would have annual excursions from every town and hamlet throughout the South to the larger and more thickly populated cities, so as to convey to them more forcibly a better understanding of the better class of building operations. We believe that if those interested in building operations in the South would more closely study and follow the methods as are used in the larger cities that, while the time is not yet at hand when money will be spent so lavishly on buildings in the South as is being done in the North, nevertheless it would have a tendency to make those interested want to do better things, and, instead of following one bad architectural example after another, try to improve by studying the best modern building methods and models. Man is a selfish creature, and when someone has something that he has not there immediately springs up a desire on his part for the same thing. When a client goes to an architect concerning some building operation he usually has some suggestions to offer about something he has seen somewhere and wants something similar for his building. So it is with the public generally; if they could see and come in contact with the better work that is being done, they would not be satisfied with something not equally as good, and would strive to secure a better class of work and more consistent designing, and would not be influenced by the architect or builder who agrees to do their work the cheapest. There has, however, been a marked improvement during the past several years, not only in the quality of material that is being employed, but also in the design of the buildings that are springing up in all sections of the South. This we attribute largely to the fact that the people are becoming educated to the better things in building through magazines and travel, and will entrust their work only to those of known experience and ability, and, realizing the importance of building well, are much more liberal in their appropriations.

A brief comparison between the conditions that formerly prevailed with those of the present might, perhaps, better illustrate our meaning. Where formerly the ordinary construction was used, consisting of wood joist and studding, resulting in innumerable cracks, owing to the unseasoned lumber, steel beams have been adopted instead of wood girders for the bearing members, thereby reducing the possibilities of settling and shrinkage; and later this method has given way to the method now usually employed in the better buildings, viz., reinforced concrete construction for the floors, and terra-cotta blocks or steel studding for the partitions. Also, where formerly wood trusses were used, owing to the great difference in cost between wood and steel, especially in the outlying districts, steel is now used almost exclusively. This is made possible largely by the fact that local jobbers in almost every section of the South now carry a fair stock of steel on hand, affording immediate shipment, where formerly it was not an uncommon thing to have work on a building held up weeks and months waiting for steel from some distant market. Then take plastering, it was only a few years ago that nothing but the ordinary sand-and-lime mortar was used, and which as a usual thing was of a very inferior grade owing to incompetent mechanics, whereas now we do not consider anything but patent plaster, which is prepared scientifically, and in most cases we use a goodly portion of cement. In the plumbing line tremendous strides have been made, which again we attribute largely to travel awakening the people to the importance of a thoroughly sanitary plumbing system in their buildings above everything else. Plumbing is one of the expensive items connected with a building, but it is also one of the most important ones, and it seems like a dream when one looks back only a few years and considers the style of fixtures and class of work that prevailed in comparison with the highly sanitary system of plumbing and ventilation and beautiful enameled and vitreous-ware fixtures that are now being installed. I might also mention heating.

Everyone in the South knows that it was only a short while back that the wood stove was the sole source of heat, whereas now buildings of the most unpretentious character are provided with a steam, water or hot-air system. As for electrical work, it has practically revolutionized not only the question of light, but power as well, and the advances in itself have been marked, for, where formerly knob and tube work with ordinary asbestos-lined panel-boards sufficed, they are now giving way to conduit work and slate panel-boards. I might continue almost indefinitely, embodying the different phases that enter into a modern building, but what applies to the different branches as mentioned applies equally as well to every branch of the building industry. There is a continual improvement in all branches, which is made possible by the Southern public getting a better understanding and a closer relationship with building operations as they exist in the large commercial centers, with the result that larger appropriations are being made for all classes of buildings. Probably the best evidence of this fact is the very many modern buildings that are now springing up in almost every Southern city.

The skyscraper, with its embodiment of all modern business conveniences, is a novelty no longer; the hotel is not complete without a bath, telephone and other up-to-date equipment for each room; the railway station, no matter how small, must have its separate waiting rooms, with all modern conveniences, for the different sexes, in addition to the main waiting rooms; the public building must be architecturally good in every particular; the business building must embody every essential feature necessary for the carrying on of live, energetic enterprises; the residence must be planned to accommodate every modern idea of ease and comfort, and so on with every class of building.

We believe that the greatest help toward securing a better grade of building in general, with a small additional outlay, has been the advent of reinforced concrete construction, and that this method of construction has a tremendous future in the South. It is a well-known fact that it is a very difficult matter to get strictly high-grade lumber; the prices seem to be going up and the quality down; this applies especially to framing lumber, and, in our opinion, reinforced concrete construction will be a most important factor in the future improvement of buildings in the South. As the required steel can now be had from almost any local jobber, also cements are carried in large quantities in every section, and sand or gravel or crushed rock can be had in every locality, and as only ordinary labor is required for its mixing and installation, we believe the time is not far distant when wood construction, especially in public buildings, will be practically dispensed with, as the difference in cost is not a great deal and the advantages of the concrete construction over the ordinary construction are so manifest that it will appeal to the public and a more substantial class of buildings will be the result. However, with the great promise that the South offers for improved building conditions, there is one condition that will affect it very materially, and one which we believe the people of the South must reckon with. For it matters not how well your intentions are in the preparing of plans and specifications, they do

not adequately serve their purpose if they are not intelligently carried out for the want of proper mechanics.

There is no denying that one of the greatest handicaps and most troublesome features encountered generally on all better classes of buildings is the scarcity of skilled mechanics, as both the black and poor white labor is rather unsatisfactory and not reliable, and it seems to us that the business men of the South should offer every inducement and encouragement to immigrants and treat with them considerately, for without labor capital cannot fulfill its mission, and the building material of the South and the Southern building will not reach that degree of perfection that is had in the cities of the North until they feel the touch of the skilled mechanic.

What Southern Development Means for Construction.

By WILLIAM J. OLIVER of Knoxville.
[Written for the Manufacturers' Record.]

Mr. William J. Oliver is one of the men who are doing big things in the South and for the development of the South. For more than 20 years he has been engaged in large construction undertakings, involving at times the employment upon different contracts, aggregating \$30,000,000, of at least 10,000 men.

This is a very wide subject, with no mean ramifications, especially so when consideration is given to the different classes of work coming under this head.

The South has only recently been awakened to industrial activity. In consequence the field for growth and expansion in all lines is practically unlimited, and very naturally, while the process of expansion is under way facilities have got to be provided in the same ratio that the business increases. This fact alone eliminates all other features in the immediate discussion of the subject of what Southern development means for construction work in the South.

Owing to the limited capital now controlled in the South, the contractor must necessarily henceforth be a man capable of rendering financial assistance in the promotion of industrial or other private as well as public enterprises. He must be in position to assist in financing water-works and electric-lighting projects, the building of traction lines and other municipal improvements or undertakings, and, most important of all (because of the paramount importance to the upbuilding of any section or community), he must be so situated that he can accept bonds or stock in part payment for railroad construction work. The South can expand only in the same proportion that her railroad facilities increase. Obviously that is true; but the chief question is how to raise the capital.

The present modus operandi employed in exploiting any enterprise in the South, of whatsoever nature, for the purpose of attracting Northern or Eastern capital, is to direct the subject to the attention of certain capitalists, or one of the large trust companies. (In either event the matter will eventually be turned over to a trust company to handle.) The trust company will then send their engineer to look over the ground, and, after making a more or less cursory examination of the project, he returns to his people and makes his recommendations. These recommendations may or may not favor the proposition; but in the event it is favorable, the trust company will stand the original promoters up in the road and take their money away from them, first on one pretext, then another, until their "commissions," "discounts," "interest" and other "charges" have perhaps consumed the original promoters' profit altogether. And, if they are lucky, they might have some stock voted to them, or, if still more fortunate, may get some of the bonds.

The greatest drawback to promotions of this character and by this means lies in the fact that nine times out of ten the engineer sent down has never had any experience with Southern propositions, and his recommendations do not, therefore, cover the more meritorious points in a scheme. And he is either too egotistical (because of his "standing" with the Blank Trust Co.), narrow-minded or incompetent to do otherwise than ignore pertinent suggestions from those familiar with Southern conditions.

On the other hand, the contractor would have more than a detached interest in the enterprise, for in its ultimate success depends his getting paid for work already performed. Thus it will be readily understood that the community of interest involved will cement together the promoter, the contractor and the manufacturer or operator, for what is to the advantage of one is to the advantage of the other, and vice versa.

Manifestly, therefore, it is to the advantage of all concerned that in the future development of the South the contractor shall be a man not only able to intelligently direct and supervise construction work of every character, but one qualified to lend financial aid to an enterprise as well.

Next in importance to railroad construction is construction of every description. This covers a wide field, such as buildings for factories, stores and warehouses, dwellings, etc. I have placed railroad construction first in importance because, without adequate transportation facilities, any community would be so badly handicapped as to almost preclude the possibility of its expansion and growth in a way to which its location and advantages entitle it.

I have not the time to go into the amount of contract work now under way in the South, but doubtless the MANUFACTURERS' RECORD is in position to, and will give this information to inquirers. But neither the MANUFACTURERS' RECORD nor any other individual or body can come anywhere near estimating that which will be completed or under way, say five years from now. With the urgent need of increased transportation and traction facilities, and municipal and county improvements of every description, including public works, streets, pavements, schoolhouses (and the South is woefully lacking in educational equipment), courthouses, city halls, drainage and sewerage systems, river improvements, dredging, reclamation of wet and dry lands by the installation of proper drainage or irrigation methods, as the case may be—with all these necessary improvements in view, the outlook for construction work in the South is very bright indeed, and demands comprehensive contracting on a large scale.

There are more opportunities offering in the South today in the development line than in perhaps any other section of the universe. Yet our section is anything but thickly populated, especially when compared to the New England or Middle Western States, although our advantages over these States in practically every feature are manifold. In fact, those States which have been adjudged guilty of a profligate waste of their natural resources now look to the South to supply their demand. Isn't it obvious,

then, that it is to the joint interest of the Southern people and those from the States dependent on the South for their sustenance, so to speak (and others as well), for them to make their abode in the South, thus benefiting both themselves and the community in which they locate? They could teach Southerners a lesson which they had learned only by bitter experience, which would have the tendency of impressing upon us the urgent necessity for intelligent conservation of our resources. The untouched, undeveloped resources of our Southland guarantee room for all, and when she shall have invested in her transportation facilities approximately \$4,000,000,000, as against \$2,500,000,000 now, and increased her railroad mileage to 100,000, as against some 70,000 at the present time, at the same time compelling the density of her population to equal that of, say, Illinois, we will then begin to have some tangible conception of the magnitude of our section of the county in its relation to the industrial world. We will then have in our midst a people interested to a marked degree in the South's welfare, and numbering almost as many souls as now inhabit the entire United States.

Oh, we have the room for them, and to spare. Just think what irrigation and drainage would mean for our arid and wet lands. We must populate the South with people to till our lands, and, in addition, we Southern people must learn to do actual work ourselves, for the negro as a laborer is passing. This would increase the laborer's wage, but this item is more than offset by the increased efficiency of the laborer. Can you imagine what this increased area of fertile or tillable lands means to our agriculture in conjunction with greater efficiency of our labor?

Truly, then, the interests of the contractor can be best subserved in a section where the growth of the community and his welfare coincide, in that both will be affected by the ultimate outcome of any construction project in which they will be jointly involved. And the contractor will, moreover, invest his surplus in immediate industrial enterprises with which his operations make him familiar.

I assert, therefore, that to the contractor Southern development means the "Highway to Prosperity."

GREAT TASKS FOR CONTRACTORS IN THE SOUTH.

By EDWARD INGLE.
[Written for the Manufacturers' Record.]

No other section of the country offers greater opportunities or stronger incentives to contractors of many kinds than the South. Just as its mineral, timber and agricultural wealth is still largely undeveloped, so the means for the thorough acquisition of that wealth are not yet at hand. Upon contractors will largely devolve the furnishing of the means, not only for acquisition, but also in much part for utilization. That implies that contracting in the South in the immediate future must fall into two main categories: the one, contracting that will add to the facilities for reaching and bringing to market the various forms of wealth in the shape either of raw material for industry or the finished product; and the other, contracting that will apply some of the fruits of industry and trade to the betterment of living for communities and individuals.

The latter form of contracting is being pushed with more and more vigor every year and has been more and more liberally promoted ever since, at the turn of the century, the South entered upon an era of fair prices for its cotton crop, adding millions of dollars yearly to its ready cash and giving the chance for much-needed expenditures upon such public works as sewer and drainage systems, water-works, electric lighting, streets, pavements, schoolhouses, courthouses, city halls, etc. It may be conservatively estimated that such undertakings by Southern cities and counties and States represent at present, in the various stages of contracts awarded, bonds voted or money available and definite plans, at least \$30,000,000 or \$40,000,000. These are bound to increase in number and importance as capital forthcomes to hasten the completion of the great tasks of contracting for production.

Perhaps the largest work of productive contracting is that involved in bringing up to full efficiency the railroad system of the South. Its 67,000 mileage of today represents an investment of at least \$2,500,000,000. Another \$1,000,000,000 must be spent to bring this into first-class status in every respect. This will include expenditures for double-tracking, sidings, etc. The need of the South in this particular is suggested in the fact that of the 13,704 miles of track in the six New England States, 8,230 miles are single-track mileage, while of 35,064 miles of trackage in Virginia, West Virginia, the two Carolinas, Georgia and Florida, 27,792 miles are single-track mileage, and that of the 97,486 miles of trackage in the five States once embraced in the old Northwest Territory—Ohio, Indiana, Illinois, Michigan and Wisconsin—65,069 miles are single trackage, while of the 17,510 miles of trackage in Alabama, Mississippi, Tennessee, Kentucky and Louisiana, 13,708 miles are single-track mileage. But other billions of dollars are to be spent before the South shall have a railroad equipment sufficient to meet the needs of a population which must be occupied within a comparatively few years in realizing the wonderful opportunities for comfort and happiness which this section naturally offers. I might be tempted to contrast here New England with its population averaging 100 persons to the square mile, but with scarcely any of the natural resources for wealth production so abundant in the South, and the South thus richly endowed, but with a population averaging only 33 to the square mile. Coming closer home, though, one finds in Illinois, with its minerals, timber and agriculture, a fairly good basis for comparison, rather than for contrast, with the South. Illinois has a population of about 5,000,000, just about an average of 100 persons to the square mile. That population is served by 12,201 miles of railroad, which averages one mile in length to about each 4.6 square miles of the area of the State. The South now has a population of 26,800,000, or about 400 persons for every mile of railroad, as compared with 466 persons for every mile of railroad in Illinois. The South has one mile of railway to every 12 square miles of territory. When the South's proportionate equipment as to railroads shall equal that of Illinois it will have 180,000 miles of railroad, nearly three times its present mileage, and when the density of its population equals that of Illinois the population will number 80,000,000, only 6,000,000 or 7,000,000 less than the present population of the whole country. Should the two increases coincide, the South will still have but 445 persons for every mile of railroad. The increases are bound to come. They will hardly mean the construction, certainly east of the Mississippi, of any great trunk lines comparing in importance with the half a dozen now operated in the South, but, supplemented by an enormous mileage of inter-urban electric lines, of which excellent beginnings have been made in four or five States, there will be a network of steam railroads intersecting or branching from the main lines which we now have and furthering the complete development of farm

lands, of mineral and timber tracts, the building of new towns and cities and the growth of old ones, and the expansion of the importance of a score of ports in coastwise and foreign commerce. The story of the direct connection between the betterment of railroad facilities and the added weight in commerce of Southern ports is written so clearly that he who runs may read, and a notable phase of the story is that dealing with the enormous construction work upon improved docks, elevators, warehouses, etc., at tidewater terminals, merely suggestive of similar work to be done upon even a greater scale.

Railroads in the South, though, will not be producing the best results unless the territory in which they are operating shall also have a full quota of improved highways. The criss-crossing of steam roads and electric lines in Massachusetts has been accompanied by intelligent and zealous efforts in highway improvement, until today about one-half of the mileage of the highways in the State is in first-class condition, and in other States in the North and West much progress in the same direction has been made. In the South, notably in North Carolina, where Mecklenburg county was early a leader; in Maryland, where the last Legislature provided for an issue of \$5,000,000 of bonds for State highways, in addition to an annual appropriation of \$200,000, to be shared with the counties for good road construction; in Virginia, Tennessee, Alabama, Florida, Texas and other States wise and liberal public opinion is finding expression in local or general legislation, which must become more and more embracing as the years go by, until the best sort of streets in cities and towns will merge in the system of improved highways through the country districts, the achievement of contractors.

It was once the fashion to regard water transportation as antagonistic to rail transportation. An advance from this concept was the thought of the water route as a regulator of rates on the rail route. Now the opinion is rapidly crystallizing that rail and water are interdependent and mutually beneficial. So it has come about that leading railroad men are forceful advocates of the plan for spending hundreds of millions of dollars in placing the waterways of the country in the best possible condition for traffic. In that plan the South is most vitally interested. One of the greatest water highways of the world, with its tributaries and their branches having an aggregate navigable mileage of between 12,000 and 13,000, finds its way to the sea through the South. And in that section are waterways with an aggregate navigable length of 16,000 or 17,000 miles. Little remains to be done to perfect some of these for commerce, but many of them, perhaps the majority, must be deepened and freed from obstructions of various kinds, while others must be leveed before their full powers for navigation may be available.

Some of them will be improved incidentally to their harnessing in their upper reaches in hydro-electric enterprises. Eleven streams springing from the Southern Appalachians have an estimated minimum horse-power for the year of 2,731,270, and an estimated minimum horse-power for the six high-water months of 4,929,573. These streams are by no means all of the streams with valuable water-powers in the South, nor does their estimated minimum power mark the limit to the power that may be developed with every opportunity for economic handling taken advantage of by engineers and contractors in that sort of work. To make the enterprises of permanent value, steady and regular flow of the streams must be assured, and that will tend to simplify the task of river improvement.

Allied more or less closely to the problem of the improvement of waterways for navigation purposes is that of the reclamation of wet lands, including tidal marshes, swamps formed by the seepage from flowing streams, or by springs within themselves, and great stretches of low-lying level lands from which heavy rainfalls are not naturally led away. No necessity for wresting lands from the sea equal to that which has actually made a large part of Holland during the past centuries has been felt in the South, and, indeed, such vast tracts of easily arable land in the South's 806,000 square miles of area have not yet been brought under full cultivation that only a beginning has been made with the task of getting the water off of the wet lands of the South, so that they may receive the heat and air which only are required to convert them into most productive fields. But two or three facts suggest the wonderful possibilities here. Holland, rescued by its dykes from the sea, supports a population of about 450 persons to the square mile, a density equaled by that of no State in this country. Holland has an area of 12,500 square miles. The combined area of the wet lands in the South, 55,149,200 acres, is nearly seven times the area of Holland. It is nearly half again as great as the combined area of the six New England States, and more than one-tenth of the area of the South. Tide marshes in the neighborhood of Boston grow hay, which sells for \$8 a ton; merely drained, these marshes not only produce more hay to the acre, but hay which sells for \$25 a ton. When the reclaimed marsh is devoted to cranberries its value increases to \$1000 an acre, and when used for growing such crops as asparagus, peas, potatoes, lettuce, beans and cabbage, the profits per acre greatly exceed those derived from the marsh hay on the North Atlantic Coast, or the rice on the South Atlantic Coast. In Louisiana 7,000,000 acres of wet lands are to be reclaimed. Detritus, brought down by the Mississippi river through thousands of years, has made this land, whose character, as tested by borings, is unchanged for hundreds of feet in depth. With the water withdrawn this land is worth at least \$100 an acre, and will yield under cultivation from \$25 to \$50 a year net profit at the minimum. Imperfect control of the Lower Mississippi River is responsible for 30,000 square miles of wet lands, which, when reclaimed, are capable of raising more cotton than the present annual cotton crop of the whole South, from 12,000,000 to 13,000,000 bales, with the seed valued at \$700,000,000 to \$800,000,000. Following estimates made by Government experts, the present value of the unreclaimed wet lands of the South is \$442,000,000. The cost of reclaiming them would be about \$827,000,000, and their cash value after reclamation would be quite \$3,300,000,000, an amount greater than the total value of farm lands and improvements in the whole South eight years ago. Surely this increase of wealth is worth working for. Some of it is to be gained as an auxiliary result of the improvement in the lower stretches of the rivers or in the realization of the practical plan already begun in part, of giving an inland waterway along the Gulf and Atlantic Coasts; some of it must come through individual enterprise; but probably the greater part of this reclamation is to be done by contracting on the most comprehensive scale.

The attempt has been made in this article only to sketch in outline some of the big things to be done by the South before it may enter upon its own. No man interested in the South can view the prospect without being inspired with ambition to participate in the development, not only because of the betterment that may come to him in sharing in the work of constructing railroads, public highways and municipal assets

of various kinds, of reclaiming through drainage or through irrigation, or through a combination of both, millions of acres of fertile soil, and of turning the power of rivers at some points into industrial force and into the bearing of the burdens of commerce at other points, but also because of the joy of doing for the South.

WHAT SHALL WE DO ABOUT OUR COTTON?

By COL. HENRY G. HESTER of New Orleans.
[Written for the Manufacturers' Record.]

Col. Henry G. Hester, for more than a generation secretary of the New Orleans Cotton Exchange, is the Southern statistical authority on cotton. His position in that respect has been substantially recognized by the United States Government. He is a member of the staff of the Governor of Louisiana, of the State Board of Labor Arbitration and Conciliation, and a commissioner of the Sewerage and Water Board of New Orleans.

In a recent magazine article on "Unjust Attacks on Business," by Senator Beveridge of Indiana, one of the younger group of United States Senators, he makes the assertion which has all the force of a truism: "Business is not the only thing in life—not even the most important thing. It is written that man shall not live by bread alone. Ideals are the life of the soul of man; yes, but we need not starve our bodies while we feed our souls. The barren table does not stimulate morals. An idle people does not march Godward. The Bible is not the enemy of bread. The greatest office of prosperity is that it gives men and women time and strength to think of higher things and to realize them."

While the writer's words refer to the country at large and the disposition of the past few years to view with suspicion and distrust all great enterprises which have arisen as necessary adjuncts to the enormous increase in the production and transfer of values, do they not apply with significant force to the cotton States? Have not the "assaults on the evils of business degenerated into an assault on business itself?" Yet, as truly said, business is nothing more than the people working together. Business active means prosperity; business stopped means starvation. Check business, and the farmer's plow rests in the furrow or he receives as the fruit of his labor a bare sustenance—not even a decent living; "the banker's money lies idle in his vaults;" spiders do the spinning in the factories; hunger sets the table in the home of the laborer; the laborer himself tramping the streets in search of work. These, if not the precise words, are in effect the deductions of the writer quoted. They are the natural and only conclusions to be drawn from conditions which are the effect of the trend of the mass of our people, culminating in the acute results of the past year.

It would be a useless waste of time and space to attempt to analyze in detail the causes which led to the panic through which we have just passed. When the clouds shall have all rolled by and the sunlight of prosperity again shines upon the remotest corner of the country, able pens will doubtless sum up the entire matter briefly as the result of "fear, distrust, suspicion," and it will be wondered why the "brainiest" and most prosperous people the world has ever known could have been made the victim of a scare with such scant foundation.

It is the same old story; has happened before, and will happen again in the lapse of time.

Thus much for the country at large. Our particular concern is with our own section.

Was there a panic among the agriculturists of the South and their neighbors and allies of the West? Did they suffer from the same general causes which affected the great commercial and financial centers?

Remarkable facts are coming to light in this connection.

The United States Agricultural Department has just issued a statement showing that the corn crop of this year (1908) was 76,331,000 bushels larger than that of 1907, and that its value was \$1,616,000,000, an increase of \$279,000,000. Corn was worth 60.6 cents per bushel, or, say 9 cents per bushel more than last year, so that on the basis of last year's values the farmer received the equivalent of over \$3.65 per bushel for every bushel in excess of the 1907 crop.

The wheat crops (winter and spring) were 30,515,000 bushels in excess of 1907, and their value was \$617,000,000, an increase of \$63,000,000.

In face of increased yield, wheat was worth five cents per bushel more; so that the two crops, corn and wheat, which aggregated in value \$2,233,000,000, while 106,846,000 bushels greater, were worth \$342,000,000 more than the yield of 1907. Where and how did the panic affect the outcome for the corn and wheat farmers? Both products were in greater supply, and with doubt and distrust the world over, nowhere more emphasized than in our own country, corn increased in value per bushel nearly 17½ per cent. and wheat over 6 per cent.

How was it with cotton?

It is not necessary to enter into a maze of figures that would only befog the reader, instead of making the facts clear. Everyone interested in the staple knows that the bales of American cotton marketed were 2,000,000 short, and that the mills converted into yarns and fabrics nearly 500,000 more bales than were produced.

Our farmers worked up the same acreage, and they spent as much, if not more, money in producing the crop of 1907-1908 than they did on the one of the year before, and yet they received for it \$40,000,000 less.

Panic or no panic, conditions were such as to favor much higher prices than were obtained. Facts as to outcome of production were known early in the season, although the extent of consumption could not be as closely approximated. The indications were sufficient to make it reasonably certain that the supply would fall short of the demand, and that the mills would be forced to fall back upon their reserves. The farmers in their conventions named 15 cents per pound as a reasonable figure, but had they averaged within two cents, or say about \$10 per bale, of that price, the South would have been richer to the extent of about \$100,000,000.

This is the sum that the best thought of the cotton States believes to have been sacrificed on the cotton crop of 1907-1908. In other words, the commercial value of the crop should have been and could have been \$772,000,000, instead of \$672,000,000. For the crop of 1908-1909, now being marketed, none can approximate what will be the result.

The panic has subsided. All the world over conditions are brightening. The hum of the cotton spindle is now heard everywhere, and, although but a quarter of the new

commercial year has elapsed, the mills have already increased their takings of American cotton by 750,000 bales. It is neither advisable nor desirable to hazard an estimate; facts as they exist are all that is needed, though it may be stated that some close observers are of opinion that although the supply will be greater, it may be exceeded by the demand.

But how about the return to the farmer?

The results thus far are disheartening. For the first three months of the new season (to the close of November), the Bureau of Statistics of the Department of Commerce and Labor tells us we sent abroad 3,212,000 bales (an excess over the same period last year of 613,000 bales), and for this cotton the foreign consumer paid us \$153,610,000, or but \$822,000 more. On the basis of last year's prices, which were at least two cents per pound too low, we have by this showing actually obtained for the 613,000 bales excess of exports but \$822,000. These figures may be turned and twisted in many ways, but the conclusions thus given are irresistible. We cannot get away from the truth the United States Government tells us that the first three months' purchases by foreign spinners have averaged him 9.1 cents per pound, or an average of 2.4 cents per pound less than the low prices he paid us during the same period last year.

In brief, we have received thus far for 3,312,000 bales but a trifle more than for 2,590,000 bales of last year's crop. If, then, trade has brightened and confidence is being rapidly restored, why is it that cotton has continued to decline? The neighborhood of 9 cents at the ship's side means 8 cents or less on the farm, and with the rise in cost of the necessities of life, or, to put it otherwise, the decline in the purchasing power of gold, for which we sell our cotton, 8 cents is said to be equivalent in net results to about 6 cents a few years ago.

Government figures to the close of November as given above are disinterested beyond question, but at the moment middling cotton is below 8½ cents per pound at New Orleans, which means 7½ cents on plantations. If the cost of production is 8½ to 9 cents per pound, what is the farmer's position? Is he selling his products at \$5 to \$7.50 per bale of 500 pounds less than it costs him? If this be true, how long can he last at that? What will be the effect of such conditions on our Southern institutions?

And yet the ideals of those who have been the farmer's advisers have been realized. The producer and spinner have been brought into close touch. For all effect and purpose during the year 1907-1908 and during the first quarter of 1908-1909, the middleman has been eliminated and the farmer and consumer have been brought face to face.

Laws are in force in every Southern State, except Louisiana and Tennessee, eliminating outside capital from cotton; forbidding modern trade methods; making it a crime to buy or sell cotton for delivery on future contracts; to take it off the hands of the seller because it is believed to be profitable. So cotton has no friend (?) but the spinner.

Practically, the Southern people are bound "hand and foot;" they are "starving their bodies" under the erroneous impression that they are "feeding their souls." Their "assaults on the evils of business" have degenerated into an assault on business itself until the law-abiding Southern merchants and middlemen of the South have been forced to stand aside and let events take their own course.

They have retrograded more than a quarter of a century; driven out modern machinery of trade in use in all other sections of the United States and throughout the rest of the business world, shutting off millions upon millions of capital willing and eager to invest in cotton under guarantee of proper protection.

The misfortune is that each generation must learn for itself through hard-earned experience. We may read of conditions which existed in the past, when the farmer and spinner stood face to face, with perhaps only an agent between them, who acted as a direct intermediary; times when the stereotyped report at certain seasons read: "Spinners, having supplied their immediate wants, are now out of the market awaiting a more favorable turn (or a further decline) in prices." Such reports were then common even when quotations, as they now are, were below the cost of production. Then, as now, there were but two parties to nearly every transaction—the farmer and the spinner, the latter of whom knew the producer's weakness and had only to stand aside for a sufficient period to force the inevitable. There are few now living, perhaps, or at least now actively engaged in the cotton trade, who remember the utter hopelessness which such periods of artificial depression spread throughout the Cotton Belt. Thousands of producers were ruined in those days, only to give room to others who followed in their footsteps, believing that they knew of and could produce nothing but cotton.

In most respects ours are now an entirely different people; better read and better posted as to the statistics and markets for their products; in many sections understanding the value of diversification of crops; how to produce a superior article of the staple; avoiding slipshod methods which formerly flooded the markets of the world with low-grade and trashy cotton. The average Southern farm of today is a paradise compared with those of a period many years subsequent to the Civil War; but still existing conditions seem to prove a remarkable want of understanding among growers of the broad principles of political economy. It seems that among no other people except the men of the South have the isms and false doctrines of demagogues and self-seekers prevailed to such an extent. It cannot be this has been from want of intelligence, for nowhere on either side of the Atlantic are the people, as a class, brighter. They know how to work and to bring forth from "mother earth," even where the soil is poorest, better results than agriculturists of other countries; they are apparently weak only in securing money results for their labor; they repel capital where other people not only welcome it, but eagerly seek it.

This certainly does not lie in want of natural intelligence, for, as stated, they have no superiors as agriculturists among other nations, and they rank with the best farming element of other sections of this country.

The cause, therefore, can only lie in want of thought; in permitting others to think for them when they are best able to do their own thinking.

Have they not given too great heed to the "walking delegate," whose chief interest is in promoting discord and upsetting the natural and legitimate order of things?

Last year's experience has set the best brains of the South to thinking deeply on these lines, and what is transpiring now is an object-lesson to the rank and file of thousands who have been following "false gods."

Many years ago the people of the great West passed through the same experience. Demagogues among them preached the same doctrines, and for a time they heeded them; they were told (and they believed the tale) that the middleman was their natural enemy, and they went to the men whose interests lie in buying their products as cheaply

as possible. Some of them (fortunately not a majority) linked hands with certain of the manufacturers (not all), who knocked at the doors of the National Congress with a plea for the enactment of laws which would eliminate the "dishonest and designing middlemen, who were the sole and only cause of the farmers' woes."

But the men in Washington who represented the country at large did not take kindly to that line of reasoning; they were unwilling to undermine the vast fabric of trade which was then making and has since made the United States the richest and most powerful nation on the face of the globe. They wanted more time to think over the proposition. This was about 20 years ago, and they have been thinking ever since, with the result that they have decided that while some corrections were advisable, the modern system of trade is good.

Meanwhile the men of the West dropped the isms and those who advocated them, and they have prospered and grown rich, increasing the annual value of their corn and wheat from \$950,000,000 to \$2,250,000,000. Their State Legislatures and those of other States outside of cottondom in time adopted wise laws, punishing men who, though not members of duly incorporated exchanges or commercial bodies, used the published quotations or prices obtained on the floors of those institutions for betting purposes; but while they legislated against "bucket shops," they were careful not to interfere with legitimate trading or contracts having for their foundation the actual articles therein specified. On the contrary, they encouraged any and every one willing to aid them in making a market for their products. Whether or not they were wise in so doing is evidenced in the remarkable progress of their industry just quoted. Our slogan should be identical with that of our brethren of the grain States: "It matters not who buys our cotton, so long as we are paid for it a fair and living price commensurate with the cost of its production." In doing this we can, in strict accordance with dictates of the Almighty, "feed our souls without starving our bodies;" we can eliminate the parasites without killing our business.

THE PROSTITUTION OF COTTONSEED.

By ANDREW M. SOULE, President of the Georgia State College of Agriculture.
[Written for the Manufacturers' Record.]

Andrew M. Soule, after a career in Canada, became well known as a leader in scientific agriculture in the South in connection with his work at the Tennessee Experiment Station and as dean of the College of Agriculture of the Virginia Polytechnic Institute. Since 1907 he has been president of the State College of Agriculture at Athens, Ga.

What becomes of our annual crop of cottonseed is a question well worthy of our earnest consideration. In 1907 it appears that we produced 5,912,646 tons of seed. Of this amount, 3,843,981 tons were crushed, and there was obtained therefrom 175,724,840 gallons of oil and 1,785,804 tons of meal. Apparently, 2,068,665 tons of seed were consumed on the farms where they were grown. Only a small fraction of this amount was used for seed, however, so the balance must either have been fed or used directly as fertilizer. If used as feed or fertilizer, it would not have half as much value per ton as cottonseed meal. Yet these 2,068,665 tons of seed contain on a low estimate 40 gallons of oil each, or a total of 8,274,700, worth, at 40 cents a gallon, \$33,098,800. In other words, this enormous sum of money was worse than wasted, for the oil is of no service whatever in plant production, being, if anything, a detriment. Fortunately, it does not deplete the fertility of the land, as oil consists of carbon, hydrogen and oxygen, elements of plant nutrition obtained directly or indirectly from the air and soil.

But why this enormous needless annual waste? Surely this is a sum of money well worth saving, and would we not be infinitely better off to send these two million and more tons of cottonseed to the oil mills every year and exchange them for cottonseed meal, with its high feeding and fertilizing value? To illustrate the point, let us cite the fact that 41,880,304 gallons of oil were exported during the fiscal year 1907. This oil brought an average of 40.8 cents a gallon, or \$17,074,403. During the same year 670,484 tons of cottonseed meal and cake were exported, at an average value of \$25.45 per ton, making in all about \$17,062,594. The oil exported took with it no plant food; the cottonseed meal and cake exported carried away on the basis of 18 cents a pound for nitrogen, 6 cents for phosphoric acid and 6 cents for potash, more than \$30 per ton of plant food, or \$20,114,520. In other words, we received \$3,051,926 less for our cottonseed meal than the plant food contained in it was worth, and yet it has been demonstrated over and over that a ton of cottonseed meal is worth more for the nutrition of certain classes of live-stock than almost any concentrate which can be purchased and utilized by the farmer.

Cottonseed meal must certainly have a high feeding value, or else the discriminating farmers of Great Britain and Europe would not use it so freely. That they appreciate its virtues is shown by the lavish way in which they buy it. In 1895, for instance, the amount of cottonseed meal exported was 244,858 tons, which brought at that time \$17 a ton. The figures quoted show that it brought in 1907 \$25.45, or an increase of \$8.45 per ton. Instead of the increased price reducing the consumption, the above figures show that almost three times as much cottonseed meal was exported in 1907 as in 1895. Where does this cottonseed meal go? is naturally an interesting question. It is chiefly exported to Denmark, Germany and Great Britain. In 1907 Denmark took 277,124 tons; Germany, 224,064 tons, and Great Britain, 90,539 tons. These same countries in 1900 consumed, respectively, 136,579, 190,424 and 158,629 tons. Notice the remarkable increase in consumption shown by Germany and Denmark. Apparently there is a considerable falling off so far as Great Britain is concerned, but it should be remembered that in recent years Great Britain has obtained a part of its supply from Egypt and other countries, so that in all probability the stockmen of that country are using more than ever at the present time. The chief interest of Denmark is in dairy husbandry. They have not the naturally favorable conditions of soil and climate that pertain in many sections of the United States, yet they have developed a dairy business of phenomenal proportions, and supply a large part of the prime butter consumed in London and other large cities of Great Britain. Germany has a rapidly-increasing population and a very considerable dairy industry. The German people are among the most careful agricultural economists in the world, yet they are taking larger and larger supplies of our cottonseed meal each year, which leads us to believe they must prize it very highly as a foodstuff and a fertilizer, and realize that according to the

price paid they are obtaining a very cheap product, a truth which we are now beginning to recognize in the South.

Apparently, cottonseed meal is regarded as an essential food for dairy cattle in these European countries, and if it is true that this meal can be so largely purchased and utilized profitably abroad, it is, indeed, remarkable that it cannot be fed here at home in view of the high prices prevailing for dairy products and the large amount of these foodstuffs which are annually imported into the South. That the export demand is likely to increase is apparent from the figures quoted, and ultimately it would appear as if a market might be found abroad for all our cottonseed meal. But can we afford such a tremendous drain on the plant-food resources of our soils? We think not, for each year sees a larger outlay for commercial fertilizers which have but a temporary stimulating effect on crop growth, whereas the use of farmyard manure would increase the supply of vegetable matter in the soil, make it less liable to wash and stimulate crop production for much longer periods of time. We do not mean, of course, that the mere feeding of cottonseed meal would render the use of commercial fertilizers unnecessary or inadvisable, but it would mitigate the burden now imposed upon the farmer by his depending exclusively on commercial fertilizers, for it is realized in many sections that commercial fertilizers are not now giving the results one would naturally anticipate from them, and this is directly traceable to the fact that the soils are devoid of vegetable matter and need to be improved so far as their mechanical and physical condition is concerned to insure more stable yields of corn, cotton and other essential crops.

If cottonseed meal is worth \$25 a ton as a foodstuff, and there are few who are competent to pass upon its merits that will not admit its advantages as a foodstuff over any concentrate on the market at this figure, we are certainly losing \$20,000,000 a year by exporting it, as we are receiving nothing for the enormous amount of fertilizer it contains, and it is for the purpose of directing the attention of our farmers to this enormous annual loss that these figures have been presented, as they illustrate one of the ways in which we are needlessly prostituting cottonseed meal and losing a great part of the benefit which nature intended we should enjoy from one of the by-products incident to the production of the fleecy staple.

In the last 13 years we have exported 6,290,000 tons of cottonseed meal, containing 880,600,000 pounds of nitrogen, which, at 15 cents a pound, is worth at least \$132,000,000. It is an axiom that we cannot continually take from a given quantity of material and have anything left. We have been taking away from the soil supplies of nitrogen and other essential forms of plant food for many years, and now we are beginning to reap the result of this wasteful practice. It has already been necessary for us to put probably quite as much nitrogen into the soil in the form of commercial plant food as we have sold without an adequate return. If it had not been for the natural richness of our soils we could not have done this, but, now that the available stores of plant food which nature had been hundreds of years accumulating have been used up, we are forced to pursue other methods of practice in order to raise profitable crops. Let us cease the waste incident to exporting more than \$20,000,000 worth of plant food in cottonseed meal, as we did in 1907, for which we received no adequate return.

But this is only one of the ways in which we are prostituting cottonseed meal. Attention has already been directed to the enormous loss incident to the use of seed so largely as food or fertilizer, since the oil contained is of no benefit in crop production. The 2,038,665 tons of seed which were kept on the farms in 1907 would have yielded, ordinarily, 840,912 tons of cottonseed meal. This meal, if rightly handled, should have been worth as feed and fertilizer \$50 a ton, or \$42,045,600. It may be urged that this is a very high feeding value, but suppose it is cut in two, we have the sum of approximately \$21,000,000, and yet we have retained in the seed all the fertilizing and food value of these 2,000,000 and more tons, while we have turned into the channels of commerce a product worth over \$33,000,000 a year. There should be a fair basis agreed upon between the oil mills and the farmer, so that this enormous amount of money could be saved to the farmers of the South. Nature has given us a seed of marvelous utility, but apparently we are dissipating by far the greater part of its actual value, and just so long as we continue this needless, extraordinary and unjustifiable waste, just that much longer will we have to bear the burden of an ever-increasing annual outlay for commercial plant food.

In Georgia in 1907 815,677 tons of seed were produced. Of this amount 381,399 tons were crushed, or 46.8 per cent. of the crop. From the crushed seed there was manufactured 155,992 tons of meal and 135,969 tons of hulls. The hulls are low in plant food, but, of course, were fed at home for the most part. What proportion of the meal was exported or sent North cannot be definitely stated, but one oil-mill man reported to the writer this year that of 2500 tons put out by his mill up to that time 2000 tons had gone North, 100 tons were sold for foodstuff in the State and 400 tons for fertilizer. If this represents the figures available for even a small percentage of our oil mills, what a stream of gold is passing out of the State and not bringing an adequate return.

This article has not been written in a spirit of captious criticism, but rather to point out the great economic loss which we are now suffering from a failure to utilize one of the great gifts of nature according to the dictates of science.

Athens, Ga.

Status of Louisiana Swamp Land Reclamation.

By EDWARD WISNER.

[Written for the Manufacturers' Record.]

Mr. Edward Wisner of New Orleans is a successful pioneer in the movement for the reclamation of wet lands in Louisiana, embracing an aggregate area of 7,000,000 acres.

In nearly all lines of industrial development there was at least a partial suspension of activity during the past summer. Added to the general paralysis consequent upon the financial disturbance of a year ago, the whole business community of the United States concluded, so far as possible, to await the results of the campaign—it became the fashion to "wait until after election."

Reclamation work in Louisiana did not escape altogether the results of this disposition, yet not a single project actually under way was stopped. Probably some of the work was not pushed as rapidly as would have been done under more favorable condi-

tions, but taken as a whole, all who are engaged in this work have good reason to feel satisfied with what has been accomplished, and now that the clouds have rolled away, to look forward to a rapid development.

Two important projects were started during the summer. The larger is the reclamation of 50,000 acres by E. W. Wickey of East Chicago and John A. Brumbaugh of Elkhart, Ind.; 2560 acres have already been completed, so far as main canals and levees are concerned, and the pumping plant is being installed. The dredge work which is being done by Mr. Brumbaugh is believed, for excellence and rapidity, to outclass anything ever accomplished in this section. The first district will be ready for market early next year, and it is the announced intention of Messrs. Wickey & Brumbaugh to proceed on the balance of the lands with the usual energy.

The beginning of actual work by Mr. G. A. McWilliams of Walnut, Ill., on his contract with the Truck Farm Land Co., Ltd., at Paradis, La., was delayed by unusual weather conditions, but since the beginning of canal construction has been rapidly pushed, and six and one-half miles of 40-foot canal have been cut. Mr. McWilliams has about six miles more of canal to construct under his contract with the Truck Farm Land Co., Ltd., and when this is completed he will at once proceed to the reclamation of his large tract lying adjacent to the Truck Farm Land Co.'s holdings.

The work already in progress by the Terrebonne Land Co., Ltd., in Lafourche parish and the Suburban Realty Co., Ltd., in St. Charles parish, has been carried forward without interruption, and both companies are now engaged in colonizing the lands now ready for cultivation.

During the year, notwithstanding the lull in ordinary enterprises, more of the raw or undeveloped land has changed ownership than during any previous year since these lands passed from the State and levee boards. Over 70,000 acres have been acquired by C. A. Phillips and associates of Chicago, and these same people are in the market for more; altogether, nearly 300,000 acres have been either sold outright or contracted for, and these lands have at last a recognized value.

Among the larger enterprises now being taken up may be mentioned the Delta Land & Sugar Co., organized by Kansas City and Kansas people, who expect to reclaim 45,000 acres of land in St. Bernard parish acquired from N. A. Baker & Sons. Mr. E. R. Nichols of the Kansas Agricultural College is the president, and Mr. Berkey of Kansas City is general manager. In addition to having the highest grade of sugar land, their holdings when reclaimed are among the finest Sea Island cotton land in the world, and in a district which produced Sea Island cotton successfully before the war.

Mr. James B. Hill, who invented the Buckeye traction ditcher, has invented and is now using a plow—which is not a plow—for use in breaking the reclaimed land, heretofore one of the most difficult tasks of the reclamation process on account of the mass of grass roots. This machine is propelled by gasoline and pulverizes the sod and leaves the ground in about the same condition as would ordinary plowing and harrowing; it handles a strip 18 feet wide at one time, and will make possible the rapid subduing of the land after it is drained and without waiting for it to harden to permit the use of horses and mules. This machine and ditcher are the outgrowth of local conditions, and only prove that any peculiar work will ultimately evolve the necessary means of accomplishment.

Experience is all the time reducing the cost of reclamation, and the invention of machinery particularly adapted to local conditions will materially assist. Already it is cheaper to put in cultivation these wet prairies than it is to clear woodland of its stumps, and cheaper than most irrigation projects, and time, that important consideration in modern life, is all in favor of the wet prairies.

The season as a whole has not been favorable to the prosecution of the reclamation work. The excessive precipitation during July, August and September rendered it difficult to build levees, and some incompleting work was washed away; however, the actual damage from this source was not great, and no project has been more than temporarily delayed from this cause.

Meanwhile the local prejudice against this form of enterprise is disappearing, and it is believed that the actual successful cultivation of the lands now in process of reclamation will dissipate the remaining doubts and pessimistic prophecies, and when this is accomplished, when public recognition is complete, the victory will be won and the work will go forward rapidly. The wet prairies of the lower Delta can be put in readiness for cultivation more rapidly than land with timber and stumps, and there will be an abundance of capital ready for so sure and profitable a business when once the pioneering shall have demonstrated to the timid both the safety and the profit.

New Orleans, already a city of nearly 400,000 people, has only about one acre out of twenty of the surrounding country in cultivation; the other nineteen-twentieths are capable of reclamation, and will be far more productive than the acres now in use. What this work means to the city of New Orleans, to Louisiana and to the country at large may be conveyed by the statement that at present prices of farm products the wet lands of Louisiana are capable of producing, when fully reclaimed, a greater annual value than either the wheat or cotton crops of the United States. The most valuable adjunct to any city is a fertile acreage surrounding it; in this respect New Orleans possesses an unutilized asset unequaled by any other metropolis in all the world.

Of the vast possibilities and economic importance of wet-land reclamation the MANUFACTURERS' RECORD has already said pretty much all that is to be said. But the importance of the work will justify reiteration, and the apparent popular indifference manifested in localities where swamp lands most abound testifies the necessity of calling public attention to the work repeatedly.

Louisiana, already a rich agricultural State, produces more value to the acre than any other State in the Union—nearly twice the value per acre of her nearest competitor, Illinois, only because a large proportion of her fields are the drained alluvial river bottom lands. But Louisiana still possesses 7,000,000 acres of marshes and swamps undrained and unusable in their present condition, which can be put in cultivation with less human effort than was required for the making of the present cultivated area of the State, and which when in cultivation could produce in each year a wealth greater than the total assessed value of the State today, including all of its present farms, cities, railroads, factories and forests. These figures are not mere guesswork, but are based upon what the lands of even a lesser productive capacity are doing today. What land reclamation, even in Louisiana, alone means to the national prosperity may be conveyed in the statement that the above-mentioned annual wealth production would exceed the value of the wheat or cotton crop of the entire country at the present time.

It happens that the South contains the major portion of the unreclaimed swamps

of the country, and the area of these is greater than that of any probable arid land reclamation in many years in the entire West. In these swamps the South has an asset immeasurably greater than that possessed by any other section. Fertile acres make great cities, and here is a store of fertility which will last for ages. Gold mines may become exhausted, oil fields and coal fields may become barren and forests contain but one crop, but the vast supply of plant food which nature has stored in the marshes and swamps of the South will sustain in comfort millions of the coming generations of men for thousands of years, as have already the lands of Holland and Egypt. In the midst of the cream of this store of fertility sits the city of New Orleans, unmindful of its heritage. When and not until this city awakens to its opportunities, when it recognizes that it cannot become a great metropolis with nineteenth-twentieths of its surrounding country not only non-productive, but a nuisance, then will the dream of two centuries be translated into reality.

ROMANCE OF LOUISIANA'S RICE-FIELDS.

By W. W. DUSON.

[Written for the Manufacturers' Record.]

Probably more than any other man, Mr. Dusan is directly responsible for the wonderful expansion of rice cultivation in Louisiana. His clear vision and faith sustained him in bringing to practical results of far-reaching importance the conception of Crowley as a flourishing center of activity.

When the MANUFACTURERS' RECORD asked me to tell something about the progress of Southwest Louisiana during the last 20 years, showing the development wrought by irrigation and drainage, it seemed an easy task, but since I have thought the matter over I approach the task with diffidence, for I realize that the story is a hard one to believe. Certainly our early circulars describing the advantages of this country and predicting its future seemed to us then to be glowing enough, but our most imaginative write-ups fell short of the ultimate truth. We have progressed more than we ever dared say we thought we could progress.

If you chance to have at hand an old atlas, published about a quarter of a century ago, turn to the map of Louisiana; that part of the State lying between Lafayette and the Sabine River, and from the Gulf of Mexico northward to a line drawn through the city of Opelousas, and you will find it represented to be a bare expanse; as if it were a desert or a terra incognita. And at that time it was bare. It was a desert. It was a terra incognita, except to the wandering hunter. People who had never visited it, and especially Northern people, believed it to be one vast swamp filled with moccasins, mosquitoes and malaria. It was supposed to be the haunt of the alligator and swamp fever, and its sole redeeming feature was popularly believed to be that it was for a part of the year the home of the wild duck and the wild goose.

Occasionally a venturesome hunter from the outside world visited it in pursuit of game, and he brought back accounts of the country somewhat different from those ordinarily current. Even in the school geographies Southwest Louisiana was classed almost with the Everglades of Florida and the Dismal Swamp of Virginia.

The world knows what Southwest Louisiana is today. It needs no real-estate promoter to describe Acadia, Vermilion and Calcasieu parishes as they are in 1908. Investors from all parts of the country have visited it and invested their money in the rich lands. Homeseekers from every part of the land have settled here and their friends have visited them. Their children have gone out into the universities and colleges and have told the world about Southwest Louisiana as it is less than a quarter of a century after the map-makers of the country described it as an unknown land.

Twenty years ago the Dusan brothers started the town of Crowley, within a mile and a half of the spot where they were born. The country was then a bare prairie, with fringes of timber along the bayous. It was sparsely inhabited by Creoles and a few Americans, among whom were the descendants of an American whom the old deeds describe as "John Lyons, American." Cattle-raising was the only industry, but the scattered settlers planted small patches of corn and cane for their own use, and occasionally a little field of rice. As for the land, its value was very small. Jean Pierre Gueydan bought several thousand acres in Western Vermilion parish for 25 cents an acre. The Dusons paid about \$1.25 an acre for the choice land where the city of Crowley now stands.

For the first few years Crowley grew slowly. There were no other towns between Rayne, a small village, and Lake Charles, except a station at Jennings and one at Mermentau. In the beginning the primitive industries of the country were followed. The first settlers raised a little more corn and cane than the Creoles had raised, and the first immigrants from the North began to raise rice, damming the coolies to secure water by overflow. They saw the possibilities in rice culture. They found that when Providence favored them with a good rainfall the crop was very profitable, but the uncertainties of the rainfall made rice an uncertain crop.

Then an enterprising farmer—a Northern man, Miron Abbott of Michigan—conceived the idea of pumping water from the bayou and conveying it to his rice lands by means of canals, whose beds were even with the surface of the ground to be watered.

Within a few years there were hundreds of miles of these irrigating canals, watering thousands of acres of rice. Where a few years before the wild duck had fed undisturbed were comfortable homes, surrounded by broad, cultivated fields. The Gulf Coast rice industry had sprung into being, an industry which brings to the farmers alone more than \$15,000,000. Cities had sprung up. Manufactories had been created. Schools, churches and libraries had been built. Wealth had been created in the rice belt of Louisiana and Texas, which has recently been estimated in a statement made before the ways and means committee of the House of Representatives at \$200,000,000. More than half of this is in Southwest Louisiana.

What agency was responsible for this wonderful transformation? How were marshy prairies turned into fertile fields? How did a few years suffice to replace the scattered huts of the occasional Creole habitant with the modern farm homes of the prosperous farmer of the rice belt, a large part of them occupied by the same people who lived in the humble Creole huts?

Enterprise, push and energy is the answer to this question. Certainly, but enterprise, push and energy have been the agents that have developed all new countries, no matter what their natural advantages have been. It was enterprise, push and energy directed in the right channels. In its original condition the country was unfit for farming. There was too much water on the land, and, paradoxical as it may seem, there was

too little water on the land. The water was not properly distributed. There was too much in spots. It needed drainage. There was not enough water on the land at certain seasons for rice, which needs more water in its growth than any other cereal. It needed irrigation.

Without irrigation and drainage the land in Southwest Louisiana was worth about what the Dusons paid for the site of Crowley—\$1.25 an acre. With irrigation and drainage farm lands here are now worth from \$25 to \$60 an acre, according to location. Lands outside the corporate limits of Crowley have sold at \$125 an acre. The Rice Association of America said a few weeks ago in a statement before the ways and means committee that the wealth created by the rice industry in Louisiana and Texas is worth \$200,000,000. Included in the estimate are 650,000 acres of land which was worth on an average \$1.25 an acre; approximately \$1,000,000.

Irrigation and drainage are responsible, directly and indirectly, for the other \$190,000,000.

The irrigation problem was solved when the system of upland irrigation was devised. Canals now furnish water where and when it is needed. Hundreds of miles of canals now traverse Southwest Louisiana, and those sections not touched by canals are watered from deep wells, the water being conveyed through the land by smaller canals. The irrigation system may be said to be perfect, so far as it can be practically made perfect.

Drainage, while it has to a certain extent gone hand in hand with irrigation (for in the culture of rice drainage is quite as essential as irrigation), has hardly kept pace with it. Drainage has reclaimed vast areas in Southwest Louisiana, but it has hardly kept pace with irrigation. Drainage has helped to make our lands worth from \$25 to \$60 an acre, where they were worth \$1.25 an acre 20 years ago. A perfect system of drainage will easily double even the present value of the lands.

Even the marvelous development of the rice area of Southwest Louisiana in the past 20 years has not made us all sensible of the vast possibilities of development still remaining. Between the area under cultivation, developed by irrigation and partly developed by drainage, and the Gulf of Mexico, lie thousands of acres of land which now occupy in the public mind the same relative position that the Crowley country occupied 20 years ago. The coastal marsh lands are regarded merely as good duck-shooting grounds.

The richest lands of Southwest Louisiana lie south of the present developed lands; between them and the Gulf.

The Intercoastal Canal will pierce a marsh area that awaits only the hand of some great developer to become the richest farming lands in all the great Gulf Coast country.

Drainage will do it. There is a popular superstition that it is too low to drain successfully. It is not too low to drain without the use of pumps, but even if it were, it is so rich that the cost of draining it by the use of pumps would be comparatively trifling.

That it is not too low to drain without the use of pumps and by the ordinary drainage canal is shown by the success of the Gueydan Drainage Canal. This canal was dug by a drainage district organized by a few progressive Vermilion farmers. Although the lands it drains are nearer the Gulf than almost any other lands in Louisiana, these lands are the best drained in Southwest Louisiana, and the rice they raise is higher in grade than other rice. The drainage canal has greatly increased the value of the lands.

The Intercoastal Canal will open this vast area. It will help to simplify the drainage problem. It will be the means of draining much of the land. The canal will extend across the entire southern portion of the State, and it will open for development a strip of land averaging not less than 15 to 20 miles in width. All it needs is drainage, and experience has shown that the drainage problem here is an easy one.

This part of Southwest Louisiana has nothing like the difficulties to confront that the rest of this section had. It has no irrigation problem to solve. The first Crowley settlers solved that. It has no drainage problem to solve. That has already been worked out. It does not have to experiment with a new industry. That was done at Crowley two decades ago. It does not have to educate immigration, and it does not have to plead for capital, as we did. Capital has grown wise. It has been convinced. The rice mills, the banks, the public buildings, the churches and public schools are silent witnesses that convince capital what modern methods will do for these haunts of the wild duck. The prosperous and happy homes, where only the wild duck, the alligator, the Creole ponies and cattle lived half a century ago plead eloquently with the homeseeker to seize his golden opportunity.

Development of this marsh land has not yet really started. It may be a long time before it is fully started, but when once it begins, it is my judgment, in the light of my long experience in the development of a new country, wherein my share has not been insignificant, that the potential results are as great, if not greater, than they were in this earlier developed country.

TEXAS TYPICAL OF SOUTHWESTERN EXPANSION.

By ALBERT PHENIS.

[Written for the Manufacturers' Record.]

"No State in the Union is making greater progress than Texas, based on a permanent, substantial development." So declared the representative of a large Pittsburg concern whom I met in New Orleans recently after he had made a trip to a number of the leading Texas cities. For myself, I have not had opportunity to verify at first hands the entire scope of the claim thus made, it having been some four years since I have thoroughly covered the State by my investigations; but every report I have received from traveling men and others who have visited the various sections of the State is to the effect that all the Texas cities are growing steadily; that a great tide of immigration is flowing in, and that there is a remarkable development the whole State over, not only in enterprises, cities and towns, but in farming operations as well. Houston is expanding notably in transportation facilities, in buildings, and in industries and commerce; Dallas is increasing in wealth and greatness every day, based on the prosperity of the magnificent agricultural country of which she is the center; Fort Worth's packing-house interests have vastly increased, until they have become of really great importance; there are development projects under way in Southeast Texas that are contributing greatly to the growth and importance of Beaumont and Port Arthur; the Panhandle of Texas is filling up with settlers, and the whole coast country, from the Sabine to the Rio Grande, is witnessing a truly marvelous transformation from a former vast expanse of grazing lands to a succession of fruit, truck and other farms. This is the substance of the reports one hears, and such investigations as I have been

able to make so far, at the beginning of my Texas trip, warrant the conclusion that the picture has been by no means overdrawn.

Evidences of development at Houston themselves reflect the prosperous condition of the country tributary. With a population somewhere between 85,000 and 100,000, city and suburbs, the latest reports to the Comptroller of Currency showed deposits of \$23,000,000 in the national banks alone, an indication of the complete recovery that has occurred since the local and general prostration following the panic of 1907. Estimates of Houston lumber men are that during 1908 Houston sold \$24,000,000 worth of lumber, which was an increase of \$3,000,000 over the figures of 1907. Quantities of it went to Mexico, where there is considerable railroad development, and developments in the Brownsville district took a good share. Houston is now headquarters for the oil business of Texas, the yearly production of which is worth over \$10,000,000. Houston is the headquarters for the growing rice industry of Texas, the annual value of which crop is now about \$6,000,000. Houston has also been the greatest beneficiary of the big development in the Brownsville district, the trade of which section Houston business men have gone after with a vim and vigor that have brought victory. Houston is deriving a decided benefit not only in cheap freight rates, but in commerce as well, from the Port Houston ship channel, which has been dredged to a depth of 11 feet from the turning basin, two and one-half miles from the courthouse, but within Houston's city limits, to the jetties at Galveston. Already a commerce amounting to about \$60,000,000 has passed through the channel in the last two years, and it is estimated that when the full Government appropriation of \$4,500,000 shall have been expended in securing a 25-foot depth, \$1,000,000 a year will be saved in freight rates on the commerce that the channel will afford. The United States revenue cutter Windom, 170 feet over all and drawing 9 feet of water, signalized the success of the ship channel by coming up it as far as the turning basin in August of this year, an occasion of much rejoicing by the people of Houston. A considerable development is under way about the basin, notable among the projects being a movement by the city to provide ships and wharves on a tract of 271 acres, which has been purchased by the city on the north side of the basin, and for the development of which an appropriation of \$250,000 has recently been made by the city.

Houston has 13 railroads, two having been completed into Houston since the advent of the St. Louis & Brownsville line two years ago. They are the Frisco system, extending east via Beaumont to Opelousas, La., and the Trinity & Brazos Valley Railroad, extending north to Dallas and Fort Worth, and south to Galveston, where it owns Gulf terminals worth \$3,000,000. This latter road, built jointly by the Colorado Southern and the Rock Island, now belongs to the Burlington & Rock Island, and will be used as a Gulf outlet for those systems. Already the T. & B. V. has acquired extensive holdings in and around Houston, and also owns a quarter interest in the Houston Belt & Terminal Co., which bought 12 blocks in the center of Houston at great expense, and has completed commodious freight terminals, and is now drawing plans for the finest passenger terminals in the State, the total expenditure figuring well about \$4,000,000. President R. H. Baker last week personally acquired from H. M. Holleman a large tract of ship channel frontage at Port Houston, adjoining the city wharves, but when seen in his Houston office denied that the T. & B. V. R. R. is interested in the transaction, stating that the property will be available for elevators, manufacturing and wholesale plants, rather than railway or steamship terminals.

Adjoining this property at Port Houston, the Southern Pacific has extensive holdings, while the Gould system and the Texas Company control the south shore of the channel below the turning basin. Big projects are undoubtedly under way at Port Houston. With 50 miles interior advantage over any other Southwestern Gulf port, a vast saving in freight charges for all Texas and Western points will be effected. The inland waterway projected via Beaumont to the Mississippi River will also give Port Houston a nearer water connection with upper Mississippi Valley points.

The city limits were recently extended to embrace Port Houston, and this acquired territory, covering the terminal and steamship properties, was exempted from city taxes.

Between Houston and Galveston is Texas City, with an immense shipping development. It has direct steamship lines to New York, Mexico and other ports. Here, it is reported, the United States Steel Corporation contemplates erecting furnaces, but Houston is also bidding for this plant, and the matter is still uncertain, and cannot be confirmed at this writing.

Outside of this interesting situation, Texas railway developments at present appear to center about San Antonio, with lines projected and contemplated as follows: North to connect with the Frisco at Brady, south to Brownsville and southwest into Old Mexico. The line to Brownsville appears nearest to actual building, as subscriptions and donations sufficient to guarantee the line have already been secured. With these additional railway facilities San Antonio will become a jobbing rival of Houston, as a large territory can then be served.

South of Houston, along the coast country, there has been a large development in recent years in the raising of strawberries and garden truck, which ripen early and reach the North when the markets are bare and prices high. Strawberries come into the market here in December, and continue through several months of the year. Recently there has been a great growth in the orange industry, thousands of acres in the coast country having been planted in oranges, the Japanese, or Satsuma, variety of which appears to thrive particularly well. In some instances men have gone very extensively into orange planting, one man having arranged to develop several thousand acres, which he proposes to sell, when planted, in 10 and 20-acre tracts. Fig-raising is also being extensively developed in the territory south of Houston, and all over the State, from the Havana cigar leaf of the Nacogdoches tobacco fields to the sugar-cane plantations of the Brownsville district, there is a tendency to diversify according to the soil and climatic conditions of each locality. While Texas still produces an enormous cotton crop—sometimes as high as 3,500,000 bales, with a value running at times to nearly \$200,000,000—there is a growing disposition to experiment in all other feasible lines. Thus alfalfa-growing is being extensively and most profitably engaged in in many parts of the State, and authorities declare that alfalfa will grow apace on all the fertile lands of Texas. There was more corn raised in Texas this year than ever before, the total product being more than 200,000,000 bushels; a wheat crop of 10,000,000 bushels—premium-taking wheat at that, is some of it—and there is an oat crop of 21,600,000 bushels.

The rice crop of the State covers nearly 250,000 acres and the area is being in-

creased, and all the rice farms were formerly merely grazing lands, worth \$1 an acre at the outside, and frequently not salable at a quarter of that amount.

While there has been a breaking up of the vast cattle ranges Texas used to contain and a conversion of many of the ranches into farms and small truck-patches, it would appear that the live-stock industry has had no setback, as a whole, the system having merely changed from a few large holders to numerous small raisers of stock, with a vast improvement in the breed of cattle raised. The benefits of this change to the State at large are well illustrated in the case of the great King Ranch of a million acres or so in Southwest Texas, where thriving towns, orchards, truck farms and plantations, with values for the farm lands in some cases as high as \$50 or \$100 an acre, have taken the place of unbroken stretches of pasture lands, with a value of only \$1 an acre at best.

This development, and, in fact, a stretch extending from Brownsville to Corpus Christi and beyond, is generally included in what is called the Brownsville district. More narrowly speaking and confining the term to the 500,000 or so of acres to be ultimately served by the irrigating companies in the Rio Grande Valley—of which there are now 27—the Brownsville district proper has seen a development within the past three years as remarkable and significant as any that has occurred in the South. Before the completion of the Gulf Coast Railroad into Brownsville, about four years ago, there was no way of getting in touch with "The States" without taking a stage coach ride of 150 miles, with the consequence that a condition of somnolence overspread the entire district. With the advent of the railroad, the people began to wake up, and outsiders went in from every part of the country. Now Brownsville, with its 8500 population, is the center of a great activity; irrigation companies have spent \$2,000,000 in the construction of about 1000 miles of canals, and there will probably be as much more spent in the near future; lands that sold at 50 cents to \$1 an acre now sell, unimproved and in large tracts, at from \$15 to \$25, and where cultivated bring as high as \$100; nearly 1000 cars of fruit, vegetables and truck have been shipped out of the district this year; there is a growing development of citrus fruit raising, and with a yield of from 40 to 60 tons to the acre and replanting required no oftener than every six to seven years, it is declared the district is not surpassed in this country for the growing of sugar cane.

All Texas appears "to have a good-sized hustle on her;" but with all that is being done, there is such an enormous amount of development work before her that one may well be appalled at the gigantic task of even partially developing all the agricultural, horticultural, timber and mineral resources of the State, and any attempt to conceive the wealth of Texas—its power for the princely support of an empire—when anything like complete development has been undertaken, is staggering to the intellect. Something has been done in lumbering, but there are many varieties of valuable woods not now utilized, as everyone knows who saw the remarkable exhibit Texas made in the forestry building at the St. Louis Exposition; and, additionally, a practical system of reforestation would make Texas permanently one of the greatest timber States of the Union. There has been a considerable development of the petroleum industry, with the product reaching a value of \$10,000,000 a year, and Texas oil running the engines of several of the Texas railroads and supplying the fuel for all the manufacturing plants of Houston and many industries elsewhere; but there are other fields yet undrilled, and the coal and lignite fields of Texas are almost untouched. There has been something done in mining the iron ores of Texas, but the development of Texas' vast iron ore deposits has never been seriously undertaken yet; and so on through the category of its wonderfully varied mineral riches, "undeveloped" may be written almost across the map. In West Texas there are mountains of the finest marble, including black, white, gray, antique and other varieties, which have never been worked. There is granite, sandstone and limestone in enormous quantities, but only in the case of cement rock has there been any considerable utilization, and in that only to a comparatively limited extent. There are miles and miles of clay beds, suitable for brick, pottery and sewer pipe, and deposits of kaolin, from which the best of china and crockery ware might be made. There is gold, silver, copper, tin, zinc, lead and quick-silver, all as yet in an undeveloped state. There is salt, sulphur, alum, asphalt rock, glass sand, ochre, mineral paints, asbestos, mica, graphite, talc and fuller's earth, all awaiting capital to bring them to the light.

There is an almost endless variety of plants, herbs and shrubs, which might be utilized for medicinal purposes, for fibers, domestic uses and for food, now growing wild over thousands of acres of Texas lands and wholly unused, and the possibilities of the soil for imported crops has nowhere been tested out. As an instance, while more than half the broomcorn of the United States is produced in Illinois, it is declared by farmers from that State that it can be more profitably grown in Texas.

An almost boundless vista of possibilities for Texas arises before one when it is reflected how New England has developed so enormously without fuel or raw materials and without soil sufficient to raise the food which her people and her live-stock require to sustain life. Opportunities exist here on every hand. There is even a possibility in the oyster beds of the State for the upbuilding of an industry that would make a large community rich. Reports by authorities show that there are nearly 1700 square miles of inland bays in Texas suitable for oyster culture. If developed to the same extent as in the oyster States on the Atlantic Coast, where a yield of from \$50 to \$500 an acre is secured, it would mean an ultimate possible development here of an industry that would add \$50,000,000 or more to the wealth of the State and would build up flourishing towns and cities based on the oyster trade alone.

It would appear that Texas is beginning to catch some glimpse of the vast commercial and industrial possibilities that lie before her and to realize that in order to secure the development that her richness in resources makes possible the co-operation of outside capital is essential. There is a feeling among men who are at work here that the coming Legislature will show a more tolerant spirit toward the railroads and corporations which are anxious to aid in the development of Texas, and that something may even be done toward repealing some of the more drastic and intolerant laws of previous Legislatures. With anything like an invitation to outside capital to come and help in the work of development, what might not be expected in the near future, when so much has been done in spite of an unfriendly attitude among the legislators?

What might not Houston do, and plucky, courageous Galveston, and all the other thriving, pushing cities of Texas? Then, indeed, might Houston figure on a growth such as she dreams of, that would early make her a vastly populous center and a manufacturing city of great importance. For already she is doing very notable things in the way of achievement. In an industrial way there is now about \$10,000,000 invested in the more than 500 manufacturing institutions here, with a payroll of over \$6,000,000

per annum for the 8,800 people employed, and a manufactured product reaching about \$25,000,000 a year. Included in the list are the big car shops, the elevator manufactory and a number of industries producing a variety of manufactures of iron, steel, wood, cloth and foodstuffs. The jobbing trade of Houston foots up \$7,000,000 a year, and the wholesale trade in meat products amounts to \$3,000,000. There are five rice mills here, and Houston is the center of the rice, oil and lumber interests of the State.

Houston operates under the commission form of government. With a \$53,000,000 assessment, about two-thirds the actual value, there is a tax rate of \$1.80. All the new school buildings and the city paving are being paid for out of the revenues of the city. The city has purchased ground and is entering into a contract for an auditorium which will have a seating capacity of 15,000. It is proposed to have the building completed in time for the annual fall carnival of 1909, when, in addition to those festivities, somewhat in keeping with the Mardi Gras celebrations at New Orleans, there will be industrial features, particularly a rice exhibit, with working models of rice-milling machinery, etc. Houston will make a bid for national conventions thereafter, as well. The cost of this improvement and grounds will be about \$250,000.

More than \$3,000,000 worth of new buildings are in contemplation here now, including the auditorium. Work has been commenced on a \$500,000 courthouse; on the Federal building, to cost \$400,000; eleven-story office building for the Scanlan Building, \$400,000; eight-story addition to First National Bank building, \$154,000; ten-story building for Houston Chronicle, \$200,000; eight-story annex to Bristol Hotel, and eight-story reinforced concrete office building on Main street for Jesse H. Jones, aggregate cost \$350,000; annex to Macatee Hotel, \$15,000; American National Bank, Thalian Club building, and several smaller buildings in the business district, being remodeled at a cost of \$250,000 in the aggregate; Woodland Heights Ward school building, to cost \$35,000. Work to be undertaken soon, including the terminal railway stations, will make 1909 the greatest building year Houston has ever known. There are several projects definitely determined on, but plans for which have not been perfected, in addition to municipal expenditures of considerable magnitude. The city is to provide an auxiliary pumping plant of 15,000,000 gallons capacity, and will shortly let contracts for storm sewers, to cost about \$700,000, for which a bond issue was recently authorized. An office building for the Texas Company, an oil company operating in the Humble, Saratoga and Sour Lake fields, is reported to be contemplated. D. R. Beatty has announced his intention to erect two office buildings on Main street the coming season, and a 16-story office building, also on Main street and to cost about \$600,000, will be started the coming year by a Houston syndicate. These are accepted as certainties, and many others are considered probable, to say nothing of a long list of more or less pretentious residences, churches and minor store buildings and shops.

Houston, Texas.

BUILDING STONE OF OKLAHOMA.

By L. L. HUTCHISON, Assistant Director Oklahoma Geological Survey.

[Written for the Manufacturers' Record.]

The investigation of the mineral resources of Oklahoma is not yet beyond the preliminary stage. Enough has been done, however, to prove that there are inexhaustible amounts of the baser materials which go to make up the every-day necessities of civilized life. Much of the State's wealth is in her building stone, for she has an unlimited amount of granite, sandstone, limestone and marble of good quality.

Granite occurs in three widely separated regions, namely, in the Wichita Mountains, Arbuckle Mountains and along Spavinaw Creek, in the northeast part of the State. The latter locality is very small and unimportant at present. In both the Wichita and Arbuckle Mountain ranges there are a number of other igneous rocks associated with granite, the most abundant of which are gabbro, porphyry, diabase and probably diorite.

The greater part of the rocks in the Wichita Mountains are granitic in character. These mountains are 60 miles long, extending from near Lawton, the county-seat of Comanche county, to Granite, in Greer county. Their average width is 20 miles. A number of peaks, such as Mounts Scott, Sheridan, Baker, Quanah and some others, are from 1000 to 1200 feet above the level of the plains. Other peaks, such as Teepe, Headquarters, Longhorn and Devil's Canyon Mountains, stand 800 to 1000 feet high. All of these peaks besides a great many scattering groups and ranges, consist of massive granite, usually red or pink in color.

In other places the true granite gives way to the black granite, or gabbro, which belongs to the basalt family. When dressed it is one of the most beautiful stones the writer has ever seen. Monument-makers declare it superior in many ways to the famous Quincy granite of Massachusetts. Near the surface it often has a greenish tint, which is probably due to incipient disintegration. Such rock should, of course, be rejected unless careful test proves its color inherent and not due to weathering. In some localities the black granite is replaced by gray, the change of color being due to the excess of quartz over biotite and hornblende. This is a very desirable stone when it can be had in quantity.

Near the eastern part of the main range the peaks are composed of porphyry, which is a hard, massive rock, much like the granite, but differing from it in texture. The porphyry of the Wichitas is composed of fine gray or brown ground mass, in which are imbedded reddish or pink crystals, thus giving a beautiful red color toned with gray, or a deep brown toned with red, depending on the color of the predominating minerals.

The principal quarries operating at present in the Wichita region are at Granite and Cold Springs. There are several quarries at the town of Granite, from which very high-grade red and pink stone is obtained. The output from Granite is used chiefly for building purposes. The black granite is being quarried at Cold Springs, in Kiowa county. On fresh fracture it is a grayish black, but shows much darker after being polished.

So far as known, the porphyry in the Wichita Mountains has never been quarried. There are a number of very desirable quarry sites, but they are some miles from the railroads, so that transportation is lacking.

Two lines of the Frisco Railroad and one line each of the Rock Island and Orient pass through the mountains. Good quarries could be opened near Lugart, Roosevelt, Mountain Park, Snyder, Cache and Fort Sill, on existing line. No finer building

or ornamental stone exists anywhere in America, and it is only a question of taking advantage of opportunity in order to get choice quarry locations.

The granitic rocks exposed in the Arbuckle Mountains occur in three general areas: first, a large area, covering, perhaps, 100 square miles, in the region north of Tishomingo, between Mill Creek and Wapanucka, and the second in two smaller areas, lying south and west of Davis, known as the East and West Timbered Hills. The rock in the latter localities is largely porphyry, and, because it is so far from transportation, has never been quarried. At the present time there are no indications that it will be utilized soon.

In the larger, or Tishomingo area, granite is being quarried at or near Mill Creek, Troy and Tishomingo. The stone quarried at these places differs in color and texture. The typical Tishomingo and Troy granites are of a porphyritic character, that is, composed of large feldspar crystals, usually pink-white to flesh colored, embedded in a rose-colored ground mass. These stones take a high polish, and Government test has shown them to be very desirable for construction purposes.

Fine specimens of gray granite, coarser in texture than the Wichita Mountain gray granite, from near Mill Creek, have been examined. This rock takes an excellent finish and promises great possibilities of development.

Two lines of railroad now cross the large granite area of the Arbuckles, thus offering excellent transportation facilities. One, the main line of the Frisco, passes through Ryan, Troy, Lester and Mill Creek, and thus across the broader western extension of the region, while the Rock Island from Ardmore to Haileyville, where it joins the main line to Memphis, passes through Tishomingo and Wapanucka, and, therefore, across the narrower eastern extension.

The Spavinaw Creek granite consists of a small granitic dike across Spavinaw Creek, about one-half mile west of the postoffice of Spavinaw. During a former geologic age this dike was thrust up from below, penetrating the softer rocks, which have since been worn away, and the granite is exposed over an area of about 100 by 2600 feet on the north side of the creek. This rock is a dark pink or red granite of even texture, and has every appearance of being an excellent building and monumental stone. Owing to the utter lack of transportation it has never been quarried. If a railroad should go up the Spavinaw Valley, as is likely to be the case, this granite, it is believed, will become commercially valuable.

From the above it is obvious that there is no reason why Oklahoma should import a cubic foot of granite. There is as good granite in the State as can be found anywhere in the world, and the great variety of color makes it desirable for all sorts of commercial purposes. For example, the gabbro from Cold Springs is often superior in quality, texture and luster to the greater part of the imported Scotch and other black granites now being used for monuments. The coarse-grained granite from Tishomingo is as handsome as is found in the United States, and Government tests have proved it durable. The dark red granite from the town of Granite takes a polish second to none, and it is sufficiently resistant for any purpose.

Sandstone is the most widely distributed building stone in Oklahoma. There is scarcely a county in the State where it cannot be found in sufficient quantities for local use, and in many regions its texture, color and bedding are such that it is believed to be only a matter of a short time until quarries of high-grade sandstone will be put into operation. Generally speaking, the best sandstone is found in the region of the coal fields in East-Central Oklahoma. The greater part of the rocks of this region consists of massive beds of shale and sandstone, with occasional thin strata of limestone and workable coal. The sandstone is usually light brown to gray in color, regularly bedded and of fine texture, all of which qualities render it a handsome building stone. It outcrops usually along the sides of bluffs and cliffs and on top of the high hills.

Sandstone of high grade is found in nearly every part of more than 30 counties, containing practically all of the old Cherokee and Osage nations, all of the Creek and Seminole nations, the northern part of the Choctaw and the northeastern part of the Chickasaw nation, and all of Pawnee county. (See map.) Hundreds of cities and towns in this part of the State contain buildings constructed from local sandstone. In short, it may be said that there is scarcely a community east of the main line of the Santa Fe Railroad which is not abundantly provided with sandstone for local use, while there are many favored localities where desirable sandstone, in merchantable quantities, is easily accessible.

The region of the Ouachita Mountains, in the southeastern part of the State, has been very little investigated, but it is known to contain a number of massive ledges of sandstone. These formations are often standing on edge, due to the intense folding to which the region has been subjected. Numerous quarries have been opened to supply local demand, but they have rarely, if ever, been sufficiently stripped to reveal the unweathered stone. It is believed, with a little systematic work by quarrymen who know the demands of the trade, that splendid building stone could be obtained.

There is an area in Central Oklahoma about 50 miles in width and extending from the Kansas line south to the Arbuckle Mountains in which the sandstone varies in color from gray to red and is not so uniformly good as is the rock of the region described above.

In the western part of the State sandstone is not usually abundant. This is the region of the redbeds, and practically all of the sandstone there is red. Ordinarily it is rather soft and often unsuited for good building stone, but occasional ledges occur in many of the central and western counties from which durable building stone is obtained. Such towns as Anadarko, Elk City, Weatherford, Mangum, Cheyenne, Sayre, Woodward, Alve and Taloga contain buildings which have been constructed from local deposits of the red sandstone.

Next to sandstone, limestone is the most widely distributed building stone in Oklahoma. It occurs in inexhaustible quantities in six different regions, while marble is restricted to a single small area near Marble City, in Sequoyah county.

The largest of the limestone areas is in the northern part of the State. The region containing the workable ledges extends from Newkirk and Pawnee on the west, to Chelsea and Catoosa on the east, and from the north line of the State southward as far as Jennings and Sapulpa, with a number of their beds extending farther south. In this area, which comprises approximately 5000 square miles, the rocks consist of heavy ledges of limestone, varying in thickness from 10 to 75 feet, interbedded with sandstones and shales.

The limestone region next in size is that part of the Ozark Uplift which occupies Northeastern Oklahoma. It lies east of the Grand and north of the Arkansas River. This region comprises an area of approximately 2000 square miles. The rocks are mainly limestones, sandstones and shales of carboniferous age. Of these the limestones

are of the greatest industrial importance. This region contains the southwestern extension of the horizon of the famous Carthage limestone of Missouri, and it is believed that a little careful research will reveal limestone of equal value in Oklahoma.

The limestone region third in importance in point of size is situated on the Red River Slope, south of the Arbuckle and Ouachita Mountain uplifts. The rocks of this region consist of alternating limestone, shale and friable sandstones, with the limestones of predominating importance. The principal limestone formations are three in number and have a combined thickness of approximately 200 feet. These limestones outcrop along a line nearly parallel to the Red River from the vicinity of Ardmore to the Arkansas line. Many quarries, from which excellent building stone is being taken, have been opened to supply local demand, but none are being operated on a commercial scale.

The limestone region fourth in areal extent, but possibly first in importance, is the Arbuckle Mountain uplift. There are four prominent ledges in the region. The lowest, geographically, and the most important is the Arbuckle limestone, which is 4000 to 8000 feet thick and consists of alternating massive and thin-bedded ledges. It varies in color from white to cream, and carries occasional cherty concretions. The Viola limestone lies, stratigraphically from 1500 to 2000 feet above the Arbuckle limestone, and is from 750 to 1000 feet thick. This formation is usually white to bluish in color. It is much harder than the formations with which it comes in contact, and it is, therefore, invariably well exposed, occurring as ridges and hills. The Hunton limestone is white and yellowish in color and sometimes contains chert concretions. It is 200 feet thick in places, and often alternately thick and thin bedded.

The fourth limestone member of the Arbuckle region is the Sycamore formation. It was worn away in many places by erosion during a former geological age, and is often locally absent. Where it has its greatest development, however, it is about 150 feet thick. This limestone thins out to the eastward, but becomes thicker toward the west.

The only use to which the limestone of the Arbuckles has thus far been put is for railroad ballast and concrete work. It seems impossible that so much high-grade limestone could exist without containing some very valuable quarry sites.

The region fifth in importance in point of size is situated along the northeastern side of the Wichita Mountain uplift, 10 to 30 miles northwest of Fort Sill. This limestone is of about the same age and character as the massive Arbuckle limestone of the Arbuckle Mountains, and has every appearance of being a good building stone. It is being crushed near Richards to supply railroad ballast and stone for concrete work, but no building-stone quarries of more than local importance have yet been opened.

The sixth limestone area is composed of the Wapanucka limestone, which outcrops along a line extending from near Atoka to Le Flore, in Western Le Flore county. The faulting and folding of the region in which this formation occurs has turned the limestone on edge and its outcrop forms what is known as the Limestone Ridge. This is the stone that is being crushed at Limestone Gap. It has been quarried for local use at different localities throughout its extent. The beds at the top of the formation are white, massive and often oolitic. Locally, it has the appearance of marble. These characteristics make it, at that horizon, highly desirable for ornamental and finishing work.

Technically, marble is limestone that has been changed, or metamorphosed, by the action of heat and pressure. In common parlance, however, any limestone that takes a good polish is a marble. If we accept the latter definition, there are a large number of ledges of marble in Oklahoma. For instance, the Arbuckle, Viola, Hunton, Boone, Pitkin and Wapanucka limestones are often so hard and fine grained that they take a good polish, and in this sense are marbles.

There is, however, one region in Oklahoma where true marble, that is, metamorphosed limestone, has been found in commercial quantities. This region is near Marble City, in Sequoyah county, on the Kansas City Southern Railroad. The area which contains the marble occupies four or five sections. The stone is known to be more than 200 feet in thickness, thus making the approximate amount of available marble to exceed 10,000,000,000 cubic yards.

In color it ranges from a pure white to a pink, and in places shows the characteristic mottled or marbled appearance of gray marble. This stone has been used in a number of public buildings, one of the most prominent of which is the Pioneer Telephone Building of Oklahoma City. A block of the marble subjected to pressure tests six months after it was removed from the quarry showed a crushing strength of 12,000 pounds to the square inch.

The possibilities of opening up quarries in Oklahoma are exceptionally good. It appears that the main reason good quarries are not yet being operated is because of the heavy expense of removing the weathered rock and overburden. Stone is naturally put upon the market before the weathered and weakened surface rock is removed, and, of course, the quarry soon comes into bad repute. There are at present but eight crushers operating in the State, and these can by no means supply the demand for crushed stone for concrete work, paving, ballast, etc., so that one could make a quarry pay well from the beginning by installing a crusher and marketing the refuse as crushed rock and putting only the first-class stone on the market for building stone.

IMPORTANCE OF CIVILITY IN BUSINESS.

By I. S. FIELD.

[Written for the Manufacturers' Record.]

Among the qualities of mind and heart which conduct to worldly success there is no one the importance of which is more real and which is more needed, yet which is more generally underrated at this day by the man in business, than courtesy; that feeling of kindness which expresses itself in agreeable or pleasing manners. Owing to that spirit of self-reliance and self-assertion, men are too apt to despise those nameless and exquisite tenderesses of thought and manner that mark the true gentleman. Yet history and every-day life are crowded with examples showing that, as in literature, it is the delicate indefinable charm of style, not the thought, that makes a work immortal; so it is the bearing of a man toward his fellows that oftentimes more than any other circumstance promotes or obstructs his advancement in life.

Courtesy has a great deal to do with the estimation in which men are held by the world, and it has often more influence in the government of others than qualities of

much greater depth and substance. Sometimes we may complain that some men are more for form than for substance, for the superficial rather than for the solid contents of a man. But the fact remains, and it is a clew to many of the seeming anomalies and freaks of fortune which surprise us in the matter of business prosperity. The success or failure of a man has been dependent upon his address and manner. There may be a few people who can look beyond the rough husk or shell of a fellow-man and see the finer qualities hidden within. Yet the vast majority, not so keen nor tolerant, judge a person by his outward bearing and conduct.

Grace, agreeable manners and fascinating powers are one thing, while politeness is another. The two points are often mistaken in the occasional meeting, but the true gentleman always rises to the surface at last. Manners are different in every country, but true politeness is everywhere the same. Benevolence and charity, with a true spirit of meekness, must be one of the ruling motives of the understanding; for without this no man can be polite. Politeness must know no classification; the rich and the poor must alike share its justice and humanity.

The true gentleman is recognized by his regard for the rights and feelings of others, even in matters the most trivial. He respects the individuality of others, just as he wishes others to respect his own. He is quiet, easy, unobtrusive, puts on no airs, nor hinting by word or manner that he deems himself better, wiser or richer than anyone about him. He is never "stuck up," nor looks down upon others because they have not titles, honors or social position equal to his own.

The gentleman in business has sympathy and quick perception of and gives attention to little and apparently insignificant things that may cause pleasure or pain. It is said of a business man in Memphis, he never turned a drummer away without hearing what he had to say. On one occasion when a ubiquitous individual selling soap powder had been told to wait until he could give him a hearing his partner said, "Why do you want to talk to that man when our shelves are loaded with goods he is trying to sell?" His reply was, "He has to make a living as well as we." The good reputation of this man traveled all over the Southern country, and whenever there were any snaps he got them. This Memphis concern had been buying of a certain sugar firm for years, and when the young man who had tried to sell soap powder and failed became identified with this same sugar firm he took occasion to show his appreciation of how he had been treated. Hearing of a promised rise in the price of sugar, he telegraphed from New York "to get busy." The merchant availed himself of the opportunity, bought all he could store, and in a few days had made over \$10,000. The young man who gave the information said he had done so because this Memphis firm had never turned a drummer down.

In another Southern city was located a big fertilizer house, the control of which had passed into the hands of a young snob. To get a hearing from him was almost an impossibility. On one occasion a solicitor called to see him, and after waiting for nearly an hour the young man in question came to the railing and called out in a gruff manner: "What do you want?" The gentleman became so enraged that he simply replied: "I am trying to purchase all the fertilizer plants in the South to form a combination, and had an offer to make you (which was a very liberal one), but I have decided, after seeing you, we would not treat with you if you were to sell at half price."

We should obey the golden rule "Do unto others as you would have them do unto you," which we can construe is the law of politeness. It is an art and tact rather than an instinct and inspiration.

Daily experience shows that civility is not only one of the essentials of success, but it is almost a fortune in itself. He who has this quality, though a blockhead, is almost sure to rise, where without it men of high ability will fail. Genuine politeness is almost as necessary to success as integrity or industry, and how few business men seem to appreciate it! What a man says or does is often an uncertain test of what he is. It is the way in which he says or does it that furnishes the best index of his character. It is by the incidental expression given to his thoughts and feelings by his looks, tones and gestures, rather than by his deeds and words, that we prefer to judge him. Good manners are well-nigh an essential part of education, and their importance cannot be too largely magnified when we consider that they are the outward expressions of an inward virtue. Like a dial of a watch, they should indicate that the works within are good and true.

It has been well remarked that whoever imagines legitimate manners can be taken up and laid aside, put on and off for the moment has missed their deepest law.

GRAPHITE IN THE SOUTH.

By DR. F. W. IHNE, President Southern Graphite Co.

[Written for the Manufacturers' Record.]

Although many million people have from their childhood up to date used lead pencils and seen the black gloss of heating stoves and kitchen ranges, and many of them know that the property of writing and the capacity of shining on the stoves is caused by "black lead" or "plumbago," but few only know that the substance which goes by these and several other names is graphite, a legitimate brother of the aristocratic diamond and also of the plebeian, though useful coal, of which latter good charcoal is the purest form.

The mineral graphite is of a steel-gray, somewhat dull-silvery, shiny color, and metallic lustre, very soft (hardness 1.15 to 2), and of a specific gravity of from 2.25 to 2.28. It makes a glossy grayish-black streak, and is of an unctuous feeling when rubbed with the finger. There is no other mineral with which it could be confounded except molybdenite, with which it has a remarkable resemblance in color, form, softness and streak, but molybdenite is twice as heavy as graphite, and its streak and color is a little more pale. In the laboratory, or even with the blowpipe, the distinction can easily be made, as graphite is infusible before the blowpipe alone or with fluxes and insoluble in acids, while molybdenite, when treated with charcoal before the blowpipe, will decompose, sulphur from the fumes being deposited on the coal. Also pulverized molybdenite is soluble in cold nitric acid, which has no effect on graphite.

Graphite is classified by the trade, and to a great extent in science also, into crystalline and amorphous, to which recently a few chemists, especially Luzi, Ludecke and Moissan, have added a third class under the name of "graphitite," which comprises mostly members of the crystalline, but also some of the amorphous class of graphite. The distinction of the graphite from graphitite proper is based on a certain chemical reaction, the yielding to a change in character and form by swelling (previously known

by another chemical treatment), and taking a vermicular appearance when treated with hot nitric acid. Graphites from one locality usually have some characteristic points in which they differ from those of other localities, though geographically often near together. One of such distinctive points, found in the graphites of some places and not to be found in others is the nitric reaction mentioned. This difference in their physical and chemical conduct between graphites, perhaps of similar appearance but of different structure, has been taken as the fundamental doctrine for grouping those graphites which yield to the said acid reaction as the class of true graphites, and those which are not affected by treatment with nitric acid as graphitites; assuming for each class a large group of localities where graphite is known to occur and from where a piece of the mineral could be obtained and heated in nitric acid.

According to this classification, among others the graphites from Ticonderoga, N. Y., and Clay and Chilton counties, Alabama, in the United States, and also from Ceylon, East India, seem to belong to the class of true graphites, while the artificial graphite made at the Niagara Falls and the graphite from Raton, New Mexico, and also the graphite from Passau, in Bavaria, Germany, would fall into the class of the graphitites. This distinction between graphites with regard to some characteristics of same, which I am inclined, according to my own observations and experience, to ascribe to the different physical and structural arrangement, density or openness and other peculiarities of the various graphites, but not to an elementary difference, is very interesting, but of no practical value to the trade, neither to the miner nor the refiner. It is true that if, from a good clean crystalline graphite, a still finer product of a very high degree of purity shall be made, then the acid process may be applied, but that is too expensive for all ordinary purposes to the dealer or consumer of graphite. In saying that this distinction between the different kinds of graphite would add a third class to the two



GRAPHITIC-ORE DEPOSIT, NORTH CAROLINA.

already existing popular divisions, I based this on the supposition that the creators of the new distinction will tolerate the continuance of the term "amorphous" applied to a certain kind of non-crystalline and perhaps micro-crystalline carbon. But if that cannot be endured, then we will perhaps in the future see the amorphous graphite excluded from the graphites entirely and have substituted the terms "graphite" and "graphitite" for the then dethroned vulgar classification made by the men who are engaged in the practice of handling graphite, and the nitric acid would, with reference to graphite, rightly assume its old name aqua fortis, indicating its parting power on minerals and metals.

Claiming not to be a reactionist, I nevertheless hold on to the old general classification in crystalline and amorphous, with subdivisions where necessary.

Pure graphite contains, like the diamond, nothing but carbon, which, under the influence of high degrees of heat in both minerals, is transformed into dioxyl of carbon, or carbonic acid. But neither crystalline nor amorphous graphite is found chemically pure, and even the assumedly fully pure crystals may enclose or have adhering some minute impurities.

The crystals of graphite belong, according to the opinion of the majority of mineralogists of the present time, to the hexagonal or six-sided system, but regularly built or unbroken crystals, six-sided prisms or tables are seldom found. That is caused to a great extent from the fact that crystals of graphite, a mineral so soft and friable, mostly, or at least very often, occur in solid pieces of granular or compact graphite, or enclosed in small druses, dislocated oblongish cavities, in clusters, or imbedded in a

hard rock, so that it is very difficult to obtain such crystals (which are not large at any rate, but very small usually) unbroken or otherwise unhurt.

Aggregations of particles and fragments in lumps of graphite, showing at many places faces and points of crystals, are frequently found in the graphites from Ceylon and Western North Carolina.

A large portion of crystalline graphite occurs laminated, in the form of fish scales, which scales are known by the name of "flakes." For that kind of graphite is the greatest demand, and it commands the highest price in the market. Graphite flakes are used for making crucibles and other strong heat-resisting articles, manifoldly used in the steel and other metal industries, for powder-glazing, as a lubricant, in electrotyping, polishing yacht bottoms, etc. Flake graphite is found in some instances in usually very small veins and accumulations in form of small pockets in granite, gneiss, ancient amorphous and crystalline schists and crystalline limestone, but more frequently disseminated through quartzite, and to a still greater extent in decomposed granitic rocks.

The granular form of the crystalline class of graphite is mostly found in the region of the metamorphous rocks in small veins and pockets, and also very frequently irregularly scattered through the soil and subsoil in various districts. The "veins" in which this kind of graphite occurs are usually no true fissure veins, but vein-like layers of short length in the partly decomposed rocks. The pocket deposits are often of considerable size, but most of them do not go down to a great depth. The pockets, which often follow each other in succession for some distance, as well as the short veins and also the single pieces from the size of a hazel-nut up to the size of a man's fist, which can be found by hundreds of thousands in the soil, furnish usually, though nearly always mixed with a great deal of impurities, a graphite of a fine quality which often is a mixture of granular and flaky graphite. The grains of this kind of graphite are frequently so fine that it has the appearance of a solid dense mass, and sometimes as if it were amorphous. But that even the most compact-looking piece of this kind of graphite is not amorphous can be seen when a part of it has been pulverized to a fineness of 200 mesh and then brought under the microscope, where its crystalline nature will readily be detected.

That scales of graphite are frequently found in such pieces of granular graphite has already been mentioned, but they contain also, although in lesser abundance, small bars, poles and plates showing some crystallization, but seldom distinct enough to permit a claim for a certain regular hexagonal crystal or crystallographically acknowledged combination thereof.

The impurities usually found as gangue material with the crystalline graphite occurring in veins, veinlets and pocket deposits are principally fractured pieces of the walls, quartz, quartzite, crystalline schist, mica, iron ore, limestone and clayey material. Where the flaky graphite is found disseminated through a part of the country rock or through a dyke material or a mass of another rock enclosed in the prevailing rock of that respective locality there are usually no other impurities to deal with than the rock itself in which the flakes are imbedded, and that facilitates the refining of this kind of graphite to a great extent in comparison with that of the amorphous class.

The amorphous group of the graphite family is nearly exclusively found in more or less argilliferous slates, scales or hard mica schist or other metamorphic rocks, decomposed feldspar and clay in which the graphite is finely disseminated or in which it is irregularly deposited in usually small cavities and other minute agglomerations, or by coating the sidefaces of the layers or filling the thin spaces between the layers of slate where they join each other. A great deal of the amorphous graphite is also found in a very intimate mixture with silicious clay, often very soft, but sometimes so hard that it yields fire to the steel, while in other instances the graphitic material is of an earthy nature. The most frequent non-accessory impurities are clay, quartz, iron pyrites and mica, and in some localities feldspar, garnets, tourmaline, rutile and members of the hornblende family.

Although the most and best deposits of graphite occur in the older rocks, as granite, gneiss and ancient crystalline schists, graphite has also been found in younger formations, and in a few instances as high up as in the coal measures. The kind of graphite found in the younger formations principally belong to the amorphous class, which, anyway, is very much preponderant to the crystalline class in the occurrence of natural graphite. Amorphous graphite is used for making lead pencils of all kinds, for stove polish, foundry facings and graphite paint.

While the localities where graphite has been found are distributed over the whole United States, the oldest, best known and most productive graphite districts are confined to the States of New York and Pennsylvania. But the number of localities where graphite is known to occur in considerable quantities may be larger in the South than in the Eastern States mentioned, and the prospect of a much higher rank in the list of graphite-producing sections of the United States is well founded, I think.

The remoteness of many of the Southern graphite deposits from railroads and markets, the usually very impure condition of the graphite ores, containing a large amount of useless or detrimental ingredients, as iron pyrites, iron, mostly brown iron ore, originating from the decomposition of pyrites, quartz and different silicates, mica and clay, and the difficulty of eliminating such obnoxious substances and concentrating the graphite, together with the long-existing prejudice of Eastern and Northern dealers and consumers against our domestic graphite, are reasons that the development of the graphite industry has been depressed and held back to a great extent in the South, like it was done in other parts of the United States outside of New York and Pennsylvania. The increase in demand and rise in price of pure graphite during the last few years has caused more attention to be paid to the reopening of old and the opening of newly-discovered deposits, and thereby demonstrated that the South possesses an abundance of graphitic ore, both of the amorphous as well as of the crystalline class.

Among the Southern States in which crystalline graphite occurs in large masses Alabama takes the lead, and then follows North Carolina. Clay and Clinton counties rank foremost among the Alabama counties in which crystalline (flaky) graphite is known and refined. In Clay county there is a somewhat corroded zone in the gneiss granitic formation about 10 or 12 miles long and over 100 feet wide, visibly commencing in the foothills and spurs of the Talladega Mountains near the postoffice, Quenelda (formerly Stockdale), and stretching in an easterly direction until in close proximity to Ashland, the county-seat of Clay county, through which flake graphite is rather uniformly disseminated at a proportion of from 3 to 7 per cent.

The depth of that zone is unknown; the various openings made thereon have not gone farther down than 75 feet, which is not much below the level of the valley, but at

the bottom of the deepest digging is still the same ore, and no indication can be observed that it should not go much deeper. This graphite-containing zone, partly occurring schistose and partly massive (hence I call the rock gneiss-granitic), is more or less corroded, friable and crumbly, rendering it easily crushable. That it is of the pegmatite order, and therefore contains no or very little mica, is a highly desirable condition for the later concentration of the graphite flakes for the market.

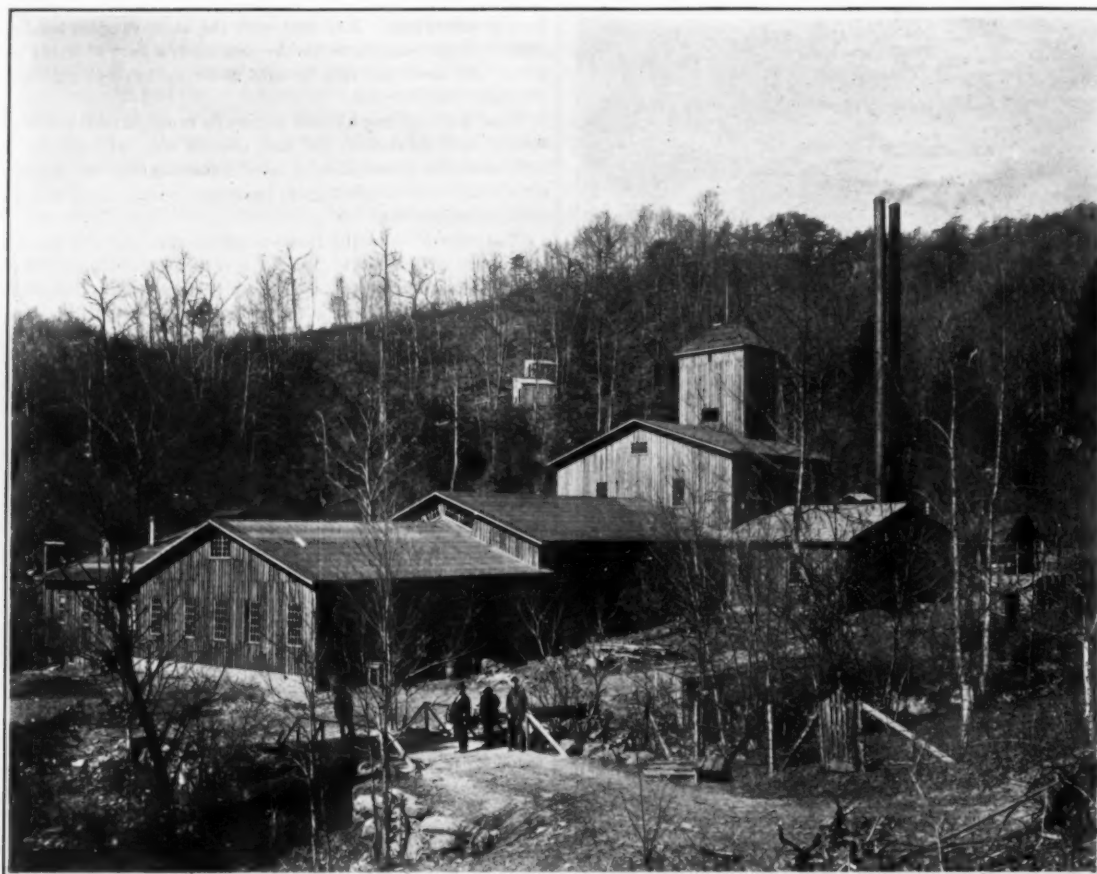
From more than 100 samples I took from about two dozen different places which were analyzed, partly by myself and partly by other chemists, I found that the rock of this long and wide zone had an average contents of $4\frac{1}{2}$ per cent. of graphitic carbon. Unlike the occurrence of flake graphite in the States of New York and Pennsylvania, where usually here and there some amorphous graphite is mixed with the crystalline, I could not detect a trace of amorphous graphite in a piece of rock out of the zone I speak of, even under the microscope. The graphite flakes are not very large, but large enough for all purposes the market demands. No other impurities, generally speaking, are found in the ore than those which the matrix, the gneiss-granitic rock, contains after the undesirable mica is gone, quartz and feldspar in the form of orthoclase. The ore zone I speak of seems to be at some places divided regarding its width into two and three parallel running parts, called the south-middle and north vein, while it at other places appears to be an undivided whole. In any case, there is a very large quantity of flake graphite represented by this zone, even above the level of the local valleys, and that can be cheaply taken out by open cuts and tunneling. I fully believe that this zone of flake graphite ore is destined to contribute pretty soon a considerable amount to the United States production of crystalline graphite, and in a not so very distant future to outrank the role which the Eastern States at present play in that respect.

Although this immense deposit of flake graphite has been hardly more than slightly

ness and technical experience, they built a moderate mill at the place mentioned. For reasons not entirely known to me, the little plant came soon to a standstill, and operations have not been resumed yet. But whatever the cause or circumstances may have been, I am positive that it was not the lack in quantity and quality of ore. For I had to examine, as mentioned before, the adjoining idle-lying property of the Allen Company about four years ago, and on that occasion I investigated also the prospect of the Alabama Flake Graphite Co., situated a little north of east of the former. There was a large deposit tapped by an open cut, and the ore exposed for a length of about 150 feet and a height of over 70 feet. The samples I took and analyzed ran from $3\frac{1}{2}$ to 6 per cent. in graphitic carbon. The mill, however, which was deprived of nearly all the machinery, seemed to have been too small to be in proportion to the large amount of ore at its disposal in close vicinity.

About two miles east of the Allen plant there is a moderate concentrating and refining mill, called the Redding plant, built about two years ago, and in operation. Its daily output is between one and two tons of graphite flakes of good quality.

Still farther east, only a mile and a quarter west of Ashland, the graphitic zone is opened at a number of places on both sides of a creek and on the surrounding hills. The deposit shows here the same character of ore and also the remarkable great width as at former places. The openings have a depth of from 10 to 20 feet, and show always the same good ore in the holes dug down in the valley of the creek as those about 60 feet higher up on top of a hill and on the slope between them. Dr. Edgar Everhart, the able member of the Geological Survey of the State of Georgia, after having inspected this portion of the ore zone, says: "In no place on the property where an exposure had been made was there found anything but decomposed granite with flake graphite. This being the case, it becomes a mere matter of arithmetical calculation to determine the number of tons of graphite ore in sight." The average yield of graphite is over 4.5



GRAPHITE REFINING PLANT, NORTH CAROLINA.

touched, some work has been done on it. About 10 years ago the Allen Graphite Co. was organized, which erected a plant on the western part of the zone, opened and worked the ore deposit a few years as much as the capital permitted. The flakes they produced were good, and for a new and rather unknown graphite section, brought for that time the high price of five and one-half cents per pound. They could have easily sold at that price three times more than they were able to produce, but endless experimenting with imperfect machinery and lack of capital brought the plant to a standstill, and it remained thus a good while. A few days before finally bankruptcy would have had to be declared the writer was sent there by a few wealthy men, two railroad men and one bank president, to examine the property, and on his recommendation it was bought nearly four years ago. After about two years' rebuilding and experimenting they began successful operation, making between two and three tons of good flakes per day and earning considerable profits thereon. The greatest depth they have reached so far is 55 feet, showing the same ore at the bottom of their big cut as they had near the surface, which yielded in practical work about 3 per cent. They have no difficulty whatsoever in selling their product at a good price, and, as a matter of course, they could sell a great deal more than their capacity permits.

The next party who followed the example set by the Allen Company was the late Paul Gilardoni of Birmingham, Ala., who sent me some years ago a sample of ore from the Clay county graphite zone to Chicago, and after my encouraging answer, in conformity with and in addition to the reports of other experts who had been on the ground, endeavored and succeeded in organizing, under the name of Alabama Flake Graphite Co., a company with a capitalization of \$100,000 for the erection of a concentrating and refining plant on a small stream near a place where an open cut had been made in the ore zone, a short distance above the wagon road from Quenelda (at that time Stockdale postoffice) to Ashland. With the assistance of some well-known men of money, busi-

per cent., and the analyses show that the percentage increases with the depth. "Finally the character of the decomposed granite is such that it can easily be milled without injury to the flakes." This locality belongs to the Victoria Flake Graphite Co. of Atlanta, Ga., which contemplated to build a large mill, but has been held back by the recent financial depression. All these companies have to haul their products to Ashland, where a depot of a branch railroad of the Louisville & Nashville system is located.

At other localities in Clay, Talladega, Elmore and Coosa counties good graphite has been discovered and partly developed by the Entiachopeo Graphite Co. and the Iron Mountain Mining Co., both organized in 1907, but the writer has not seen the properties, and was not able to obtain reliable information with regard to exact location and workings.

To figure out how much foliated graphite ore in Clay county and its neighborhood is practically in sight and profitably can be worked would give a quantity of that valuable ore against which the amount would fade away that the best producers of the East hitherto have contributed to the world's market.

In section 36, range 16, Chilton county, Alabama, about 30 miles north from Montgomery, and a few miles east of Mountain Creek, a station on the Louisville & Nashville Railroad, there is an occurrence of flake graphite somewhat similar to that in Clay county. The country rock in that section seems to be a decomposed gneiss and partly mica schist, entirely in place and undisturbed in a geological sense, which has lost a part of its mica and been substituted by graphite, forming in that way a series of more or less regular strata of graphitic schist of remarkable extent, both in length, width and depth. This zone of graphitic rock stretches out through that hilly country for several miles, and I could observe that it has a width of about three quarters of a mile. In this zone the graphite can be found nearly at every place being finely disseminated through the mass of rock, transforming it in the same way as in Clay county, from a

common rock into a valuable graphitic ore. The trend of the graphite-bearing rock follows the general strike of the formation in a direction from northeast to southwest, and the strata dips toward the southeast. A few deep gulches give opportunity to estimate the thickness of the ore-bearing zone, and I judge it of at least 150 feet. From a large number of samples I took from surface, as well as from places 2, 5, 8 and 10 feet below, I found that the average contents from at and near the surface was 2.5 per cent., and from a depth of from 8 to 10 feet was from 2.75 to 3.50 per cent. and 4.25 per cent. of graphite.

In a deep valley which cuts the graphitic zone at a nearly right angle, a pretty large-sized factory has been built by Dr. Fitzpatrick of Montgomery, Ala., and associates about six years ago. It has taken considerable time in experimenting, remodeling and learning how to work the ore, but now they are producing about two tons of flaky graphite of good quality, and thereby making a handsome return on their outlay.

Mr. F. M. Lamb of Montgomery, who has for years insistently called attention to the occurrence of large deposits of foliated graphite in Chilton county, has caused the organization of another graphite company, which operates between the former company and Mountain Creek, on the same zone of graphite as the first-mentioned plant.

Promising discoveries have been made on a few other places in the county, and the erecting of new plants perhaps will follow in the near future.

From the foregoing description of the graphite occurrences in Clay and Chilton counties it will be seen that in all probability the South will soon be a large and regular producer of crystalline graphite of a fine quality, especially as the Alabama flake graphite field alone, regarding its extension, is the second largest graphite field known, that of Ceylon being the largest in the world. But although it may be considered a fact that the already existing refining plants, together with those which are being contemplated, will elevate the South up to the first rank of the American producers of flake graphite, there is no fear of an overproduction of this valuable and much sought after mineral. The increase in demand for flake graphite and the development of new uses for graphite in the arts far outgrows the natural increase of its production, as statistics show:

Our home production of crystalline graphite was in the year 1897, 993,138 pounds, and in 1907 4,586,149 pounds, which shows an increase of 3,593,011 pounds during the last 10 years.

The consumption of crystalline graphite in the United States in the year 1897 was 20,107,058 pounds, while in 1907 it reached the height of 45,548,149 pounds, which means an increase of consumption in the last 10 years of 25,441,091 pounds.

That shows how much faster the consumption of crystalline graphite in the United States grows than the home production. The difference, of course, has to be made up by importation from foreign countries, which last year (1907) amounted to 40,962,000 pounds.*

If there is an article of which nine times more is used than the domestic source can produce, there need not be any fear of overproduction.

If, in addition to the present producers, 20 new plants, each with a production of 600 tons per year, would spring up at once, even then the so enlarged whole production could furnish only half the amount which at present is imported from Ceylon, Austria and Germany.

A good illustration of the overwhelming increase in the demand for crystalline graphite is given by the fact that the 3462 tons of artificial graphite (sold at a small fraction less than seven cents per pound) which was produced in 1907 at Niagara Falls had not the slightest depressive influence, neither in demand nor price, on the natural graphite, which it substitutes to some extent for certain purposes.

The occurrence of crystalline graphite is not known to exist in any other Southern State in such quantities that it could be compared with the large deposits in Clay and Chilton counties.

In Macon county, North Carolina, are two regular veins of good crystalline graphite. One of a width of six to eight inches and known for a length of about 80 feet is high up on Bear-pen Mountain, not far off from the Flint Company's electrically-operated mica mine; the other is a vein from 10 to 12 inches wide and carrying partly fine-grained and partly foliated graphite of an excellent quality is located on Cansler's 1000-acre tract of timber land between Franklin and Briartown. In the adjoining districts of Clay and Jackson counties pieces of good float graphite of the crystalline class have been found at several places, but no deposit of it has been located so far, except one in the latter county. That one was found on the summit of a mountain a few miles distant from Dillsboro, N. C., and it was shown me by the well-informed mineralogist, Dr. C. D. W. Colby of that city. It is a small vein of fairly good crystalline graphite that cuts through the somewhat weathered mica schist for some distance, but has the bad habit of so many graphite veins and layers of "pinching" out soon when you go down deeper.

Much more graphite of the granulate kind of the crystalline class, mixed with well-built flakes, is found on the semi-mountainous and rolling lands of Cleveland, Rutherford, Yancey, Mitchell, Alexander, Burke, Catawba, Lincoln and Gaston counties.

The "float black lead," a more or less impure but often very fine graphite, mostly granulate but partly scaly, foliated, crystalline, is very frequently found in loose pieces from the size of a pea and hazel-nut to a man's fist, and sometimes even larger; they are scattered through the soil and subsoil, and mostly thoroughly intermingled with ferruginous clay, mica and quartz sand, but also frequently, especially after heavy rains, showing a part of their glossy exterior, and therefrom having often attracted the attention of prospectors and travelers.

In the metamorphic schists of that region occurs a good granulate graphite, frequently in usually small fissure veins and layers in the upper partly corroded schists of the country rock.

Dr. Colby, who examined for the Southern Engineering Co. of Crossfork, Pa., a number of such small deposits and found that many of them "pinched" out at a certain depth and others were not followed deep enough to form a judgment regarding their persistence toward the depth, recommended building a central depot to which the graphite mined at the different occurrences by the owners of the respective lands could be delivered. This policy the Southern Graphite Co. had tried for about a year prior to that time with the people of that section, but found they could only rely on that supply when taken out by their own workmen.

Some of these veins, in connection with many pieces of "float" strewn around them on the surface and through the soil in their neighborhood, have occasionally caused

people to commence regular mining on them. But none of them have proved to be productive enough for the erection of a refining plant thereon, and finding it also too expensive to ship such impure ores to the distant Eastern and Northern mills (which furthermore are not built and equipped for the purpose of refining such ores), all attempts of that kind have ceased.

Having been demonstrated that the possession of one or even half a dozen of these more or less small deposits of good but impure graphite, together with several acres of land where "float" was scattered through the soil, was no sufficient foundation for the erection of a refining works near a place where the ore occurs, something else had to be done if that good but widely-distributed graphite ever should be utilized. The only feasible plan of utilization was carried on by the Southern Graphite Co., which quietly acquired the mineral and mining interest on several thousand acres of land where graphite or good indications of it were known in Macon and Cleveland counties, and then built a refining plant on the Southern Railway, about midway between the two counties, to where the ore from both large fields could easily be shipped, the railway rates being only 80 cents to \$1 per gross ton.

The crystalline graphite ore from such deposits and loose "float" from the counties Cleveland and Burke, Alexander and Yancey, which I refined in my testing plant, came often in such a state of purity that quite large unrefined pieces contained from 92.86 per cent. to 97.17 per cent., and even 98.18 per cent. graphitic carbon, and yielded a very fine product, in appearance and quality fully equal to the highest of its kind in the market. The granulate occurs in grains, small plates, bars and columns, and together with them (often inside of knolls) aggregations of scales and leafs are found, from which I obtained beautiful flakes, not inferior in fine, silky appearance nor in bright lustre and tenacity to the most brilliant product from Ticonderoga and Ceylon, and in softness surpassed a little only by some of the best flakes from Alabama. Of the other Southern States, Virginia, where the Naylor-Bruce Graphite Co. of Charlottesville has erected a plant for working its ore from Albemarle and Orange counties, produced some quantities of crystalline graphite worth mentioning, and indications in several other places in the South give rise to the expectation of more development in the near future.

Amorphous graphite is apparently more abundant in the South than in any other section of the great American Union, as far as we know. In a few instances there is some crystalline graphite mixed with the amorphous; for instance, in the long and wide zone of amorphous graphite that, beginning west of Graphiteville, McDowell county, North Carolina, and stretching out in an easterly direction for many miles as a part of the formation of mica schist. But the amorphous character of this and similar zones and layers in the crystalline rocks is so preponderant that I would not make a subdivision in this respect, but included it all under the head of amorphous.

Georgia possesses a large amount of the amorphous class of graphitic carbon, of which the vicinity of Cartersville and Emerson, in Bartow county, is the most productive locality in the State; it occurs there in slate and shale, sometimes in layers and sometimes in large pockets, and is always intimately mixed with more or less silicious clay, but usually free from grit.

The graphitic material is crushed and coarsely screened, and without further preparation sold cheaply to fertilizer factories, to be used both for color and weight.

I found the contents of graphite seldom over 8 per cent., but it runs occasionally as high as 11 and 12 per cent. It is of a dull coal-black color, but it would not take much work to prepare it into a product that would bring a much better price.

In the extreme northern part of Georgia, in Fannin county, and surrounding localities are similar occurrences.

North Carolina is also rich in extensive occurrences of amorphous graphite. In Wake county, a few miles west of Raleigh, near Method, and at many other places, a bedlike deposit from two to four feet wide and known for a length of at least 15 miles, the ore of which is of a deep-black, earthy and partly slaty and quartzitic appearance, with little gloss and strongly silicious, has been opened. That material contains from 10 to 15 per cent. of graphite, offers great resistance to refining, and can hardly be brought up by mechanical refining higher than to a contents of 24 per cent. carbon. The first shipping of graphite in North Carolina was done from that place many years ago.

In Macon county are known, and partly worked by the Southern Graphite Co., a number of deposits of good amorphous graphite, which, as members of the crystalline country rock, follow its strike and dip, as also in the form of quite extensive pockets in the rock. Such strata and pockets of graphite appear so frequently in some localities in that rough mountainous section that it sometimes seems as if a whole part of a mountain consists of graphite. The ore is hard, and its contents of carbon, which is mostly of a shiny appearance, varies from 15 to 40 per cent.

An apparently large deposit of an amorphous graphite of a peculiar kind occurs not far from the Pigeon River, in Haywood county. I saw there a "vein" or layer opened on three or four points; the largest of these prospect holes was about seven feet long, six feet deep and nine feet wide across the vein, showing a solid mass of graphitic ore, medium soft, though, to the pick, and grayish black in color. Striking and dipping with the country rock, which at that place consists of crystalline schists, in some upper strata frequently impregnated with small crystals of brown and black garnets, the argillaceous graphitic ore also contains quantities of same. These garnets and a considerable content of clay render the graphite of this deposit, which can be traced for a length of over 1000 feet, and may be a succession of pockets, somewhat difficult to refine. But nevertheless this can be done and a useful marketable product obtained, so that it may be worth while to work that large deposit, the amount of which in graphite varies from 30 to 45 per cent. and higher.

In Catawba county, a few miles distant from Newton, the county-seat, there is a large deposit of amorphous graphite most intimately mixed with clay, so that there is a mass of black, soft, clayey material, containing about 10 per cent. of graphite. In visiting this place, after the Southern Chemical Co. had some work done, Dr. Colby said in his report: "The graphite occurs here in a soft shale or coarse schist in a 12-foot vein, dip nearly vertical and strike about N. 30 E. for three miles, and while of low grade, the ore seems to be uniform to a depth of 30 feet, and the vein a little wider at that depth. A four by six shaft should be put down on this vein to see if the quality improves with depth."

The Pennsylvania Company, mentioned before, sent me samples from that and others of somewhat richer ore, asking if I could refine it to the high grade of 95 per cent. or more carbon. As that could not be done with this kind of ore, which is only

*Mineral Industry, Vol. XVI, 567.

suitable for minor grades, they abandoned the plan of erecting a factory near Newton. That large deposit, by the way, had given occasion once for the building of a small plant, of which I found the ruins in a branch near the shaft about 10 years ago.

Near the eastern slope of the Blue Ridge, in the most westerly portion of McDowell county, near Graphiteville, N. C., is a zone in the metamorphous mica schists in which the graphitic members of the formation are developed to a width of about 300 feet, and in a general way pretty uniform in character for several miles toward the east. That zone is built in such a way that there are a series of strata within the prevalent rocks at that locality—hard mica schist—in which a part of the mica has been substituted by amorphous and microcrystalline graphite, a mineralogical phenomenon frequently observed in this and other countries and for which the name "graphitic schists" is generally adopted. The contents of graphite of these strata is, as a rule, very low, and has been found in hundreds of samples running from $3\frac{1}{2}$ to 9 per cent., but in some parts of the series 18 per cent., and even as high as 27 per cent.

The principal impurities in this lean graphitic ore are mica, silicious slate, quartz, pyrites of iron and their product of decomposition, hydrous sesqui oxide of iron.

The photograph shows an outcrop of that large deposit of graphitic ore in a narrow branch of Mill Creek, near Graphiteville, N. C. The dark spot in the foot of the photograph is a shaft 20 feet deep, in which ore was found that contains from 18 to 23 per cent. of graphite.

Likewise, as there are comparatively rich places in the zone of graphite ore, there are also very lean, or barren, strata enclosed in same.

As no natural graphite, at least not on the American Continent as far as we know, occurs in a pure state in workable quantities, it is a fact that the entire source of our graphite has after mining to undergo certain processes of refining before the graphite can enter the market. The impurities, as we partly have seen by describing some of the various deposits, are manifold, especially those connected with the amorphous kind. The great variety of them and their intimate mingling with and stubborn tenacity in adhering to them, together with the unfortunate fact that most of the impurities found in the gangue, matrix rock or otherwise associated with the graphitic ores, have a specific gravity close to that of graphite. That the latter point is of great importance will be seen when it is considered that the most effective and commonly used methods of eliminating foreign matters from the graphite are founded upon the utilization of the difference in the specific weight of the various minerals when they fall or slowly sink after uplifting in water or air. The difficulties in the refining of graphite caused by the often so very small margin between the weight of graphite and some of its impurities are still increased if the latter, in addition to the closeness in weight, are also in shape, physical condition and size nearly similar to graphite, as, for instance, mica or clay. Another drawback in the separating of graphite from its foreign matters lies in the fact that often a number of the individuals of graphites or of the latter and foreign matters are grown or cemented together. That alters the specific gravity of the small pieces, grains, scales, plates, columns and fragments so much that we cannot rely upon equalization by sizing or making use of the difference in weight.

Therefore, the graphite ore has often to be ground fine only for the purpose of dissociating the graphite individuals from each other and from quartz, iron, mica, slate, granite, gneiss, etc., and, notwithstanding that the damage done by breaking some of the flakes and grinding the objectionable minerals or mineral admixtures down to the fineness of the graphite, thus making it more difficult to eliminate, it has been found that the loss was less than by leaving too much graphite in the tailings.

There are nearly as many combinations in mixtures of graphite with other minerals making up the graphitic ores as there are mines producing graphite. That is one of the reasons that so many different apparatus and methods of refining are in use and that the graphite plants look and are quite different from one another; while in other branches of the arts very commonly works of the same branch have a copy-reminding similarity, for instance, cotton mills, flour mills, rolling mills, sawmills, etc. Every graphite plant should be in regard to the kind of its apparatus and arrangement of same adapted to the particular kind of ore they have to treat, so as to obtain comparatively the best results, and generally this rule has been followed, often at the beginning, and sometimes after costly teaching experiences. Assuming that the designers and managers of graphite mills have always done the best they could under the only internally known prevailing circumstances and considering the great number of machines recommended for graphite refining, we still have to face the deplorable fact that the available yield after the refining of graphite ores is a remarkable low one. While the amount of gold, silver, galena and zinc blende, etc., in the tailings, especially where no cyaniding follows the concentrating, is reduced to a minimum, we find that the average loss in the tailings and waste from graphite mills ranges from 20 to 50 per cent. of graphite. In connection with the great loss at American plants it may be stated that a still larger graphite producer, in fact the largest of all, Prince Schwarzenberg in Bohemia, has to suffer from a loss in tailings and waste about as large as the former. That may be a consolation for those graphite-mill owners who have to work on a more moderate scale. But this consolation should not cause them to rest and think that such an immense loss was unavoidable and could never be prevented. To the contrary, it must not be forgotten that the impossibility of great improvements in this line has not been sufficiently demonstrated either in a mechanical or chemical respect.

Difficult as it is to diminish the loss of graphite in the tailings, it is equally so to increase the contents of carbon in many ores above a certain percentage. Therefore, it is fortunate that the trade has accepted the fact that it is nearly impossible to obtain a chemically pure article and considers a contents of from 95 to 98 per cent. as being very high and allow for a great many purposes a much lower contents. As an example in this respect I state that Eastern buyers of Alabama flakes, who, ordering in carload lots, did not object if the contents of carbon was not below 85 per cent. Such a high-graded graphite can only be made from an ore that contains crystalline graphite, as the amorphous kind in many instances will lose nearly as much graphite as it does impurities in the process of grinding, washing etc. For the purposes for which the bulk of the amorphous graphite is used a contents of from 40 to 55 per cent. is sufficient.

In view of the fact that new appliances of both cases of graphite are continuously found in the arts, there is a wide field yet for inventions serving the purpose of elimi-

nating the impurities from graphite ores, especially from those of the amorphous kind.

To point out in a general way how the refining of graphite has been done in the United States I may say that two methods are in use—the dry and the wet—both having their advantages and disadvantages, which, by the great variety of the ores and their respective adaptability for one or the other or a combination of both, cannot be generalized. In every case of erecting a new mill the ore to be refined should be thoroughly tested and then considered which method is the most appropriate for the ore in question. After that a careful selection of apparatus and their arrangement should follow.

There are many more machines and apparatus made for use in the dry process than for the wet one, and the high recommendation of such machinery by their manufacturers have often caused buyers to make erroneous choices in this respect. While the writer admits that there are cases in which the dry method is preferable to the wet one, he must also say that thought and experience has long since convinced him to give in most instances preference to the wet method. Let me quote what two highly able and well-experienced graphite experts say in regard to both processes.

Mr. W. F. Downs, at that time general manager of the Federal Graphite Co., wrote in the *Iron Age*: "Treatment for Purification by Air. This has long been a favorite field for experiment. The thin, flat scale of graphite offers more resistance to a current of air than an irregular fragment of gangue. The usual form of air jigs is further supplemented by settling chambers, dust collectors, etc., etc. These machines concentrate, but it is doubtful if they will make any pure graphite. Though frequently tried, they have never come into general use."*

Mr. Fritz Cirkel, of the Department of Mines, Canada, says in his valuable "Monograph on Graphite":

"The chief difficulty with the concentration of graphite arises from the intimate association of the constituent minerals with each other and from the similarity of their specific gravity; indeed, it is not too much to say that the proper separation of the gangue from graphite offers one of the most intricate problems in modern ore dressing. Both the dry and the wet method have their great faults, but experience seems to point to the wet method as the more successful."†

Crushing done in jaw or gyratory crushers and between rolls, with screening through stationary (grizzly) shaking and revolving screens, are used by both methods. Driers, stationary or rotary, with application of direct heat and of a capacity for heating and drying the whole amount of raw ore, pulverizers, dust-collectors, air jigs, etc., are peculiarities to the dry process, while hydraulic jigs, round buddles, tanks, floating troughs and filter presses, etc., belong exclusively to the wet process.

I believe there are no two graphite mills in the United States absolutely alike in their details; each one has something of its own and possesses some features deemed to be of importance, and therefore hidden from public knowledge.

To show the course of operation in a mill that has been built to refine both classes of ore and many varieties of each class, it might be well to describe in a brief way the plant built by the Southern Graphite Co. at Graphiteville, N. C., which can be seen in the accompanying photograph.

When the ore arrives in the cars on the sidetrack it is unloaded into bins of a capacity of about two carloads each. The bins are made on a downward grade of about 50 degrees and are about 15 feet wide on the upper end, narrowing to 5 feet at the lower, where cars of about two tons capacity take the ore and run it by gravity on a 30-inch-gauge railroad down to the factory, which is built in the valley of Mill Creek, about 1000 yards from the station. At the factory the ore is unloaded on a large platform, from which it is fed into the mouth of a "jaw-crusher," from the bottom of which two chain elevators ascend it to the upper part of the building. The latter has been built in three steplike sections, with a four-story-high tower for ore bin and water reservoir on the upper end, as can be seen from the photograph. Two boilers of 80 horse-power each furnish the steam for a 150-horse-power engine (used for driving crushers, rolls, jigs, mills, etc.) and for some washing tanks and a rotary drier for the finished materials coming from the filter press. The power needed for the pump that feeds the filter press, a mixing cylinder and the said driers is furnished by a 14-horse-power engine. The crushed material is elevated up to a pair of 36-inch rolls, from which it falls down into a revolving screen for sizing. What goes through the holes of the sizing drum is led to a system of hydraulic jigs, while the coarse material coming from the drum goes back to the elevator and is brought up and rolled over again. The sufficiently fine ore is elevated to a large steel bin high up in the tower, from where it comes down to the second floor and is distributed into six "thine mills," to which also the middlings and the fine product from the jigs are brought up by a rotary pump. The mills grind the material in water to the desired degree of fineness required for flakes or other crystalline or amorphous graphite. From the mills the ore runs off and passes automatically through a number of large tanks used for washing and freeing it from impurities, then through a "Spitzkasten" and long floating troughs into collecting tanks, from which it is pumped into a filter press.

High-grade graphite has to go through a chemical process for which a separate department is reserved. The graphite which has gone through the different stages of the refining work is of an excellent quality in every respect. The presence of both classes of graphite in the ore, together with an abundance of mica, clay, quartz, silicates and iron, etc., in so many of these ores makes the work somewhat difficult and tedious, but after studying the nature and combination of each kind, sorting and separating, working of accumulated masses of similar ore helps greatly to overcome difficulties. In those sections of the South where no other impurities have to be eliminated from the graphite flakes than their matrix, as, for instance, is the case in Clay county, Alabama, the graphite refining, though not so very easy or such playwork as generally believed, is much easier accomplished than with the complex ore of North Carolina, or even with the ore from Ticonderoga and many other places in the States of New York and Pennsylvania.

It may be hoped that moneyed parties interested in graphite will recognize the great advantage the South offers in this line. If that should be the case in the near future the graphite production of the South will soon take the rank among the graphite-producing States that it deserves from its practically inexhaustible treasure of fine graphite ore.

**Iron Age*, May 3, 1900, page 56.

†Fritz Cirkel, Monograph on Graphite, page 206.

Copper Fumes Converted Into a Fertilizer Ingredient.

By DR. JOHN SHARSHALL GRASTY.
[Written for the Manufacturers' Record.]

Dr. Grasty is one of the younger men of the South who, even before he received last spring the degree of Doctor of Philosophy from the Johns Hopkins University of Baltimore, had shown great aptitude in his chosen field of economic geology. He is Adjunct Professor of Economic Geology at the University of Virginia.

The organization of a new fertilizer company to consume a large portion of the sulphuric acid to be manufactured in the Ducktown copper district of Polk county, Tennessee, furnishes a fine illustration of how a by-product may, in the case of certain enterprises, in time become the principal product. In this instance the important by-product happens to be sulphuric acid. The interests identified with the Tennessee Copper Co. and others have organized a company known as the Independent Fertilizer Co., with a capital stock of \$75,000, so named, perhaps, to impress the fact that it is in no wise affiliated with either the Virginia-Carolina Chemical Co. or the American Agricultural Chemical Co.

This new fertilizer company is to be international in scope if it be true, as stated, that it has taken over a large number of the phosphate deposits from Maryland to Florida, and also has come into the possession of some of the larger phosphate deposits of Germany. According to the latest reports, Herman Schmidtman, known as the "phosphate king of Germany," is to be president.

The sulphuric acid made in the Ducktown district is to be shipped to various parts of the United States, but chiefly to points in the South, where it will be used in the manufacture of acid phosphate, the main ingredient of the commercial fertilizers. The control of certain of the German phosphate deposits leads to the natural inference that large quantities of this raw material will be imported from abroad and acidified at the company's factories in the United States.

This company's organization may be regarded as but a natural and necessary result of the present manufacture, and, too, as a means of utilization, by the Tennessee Copper Co. of its output of approximately 500 tons of sulphuric acid per day. The Ducktown Copper, Sulphur & Iron Co. of the same district is also building its connection with its smelter at Isabella, a sulphuric acid plant similar to the one in operation at Copper Hill and owned by the Tennessee Copper Co., with a daily capacity of 320 tons. When the two acid plants are in operation at their contemplated capacity the output of sulphuric acid in this district will not only be the largest in the South, but will be greater than at any one single point in the United States or in the world. The total daily output when the Tennessee Copper Co. doubles the capacity of its acid plants, as it plans to do, and the Ducktown Copper, Sulphur & Iron Co. gets its plant in operation will amount to 1320 tons. It will not be surprising, therefore, if the statement is made within the next few months, when the Ducktown Copper, Sulphur & Iron Co. will have finished and gotten its plant into operation, that they, too, have organized a subsidiary company similar to the one recently organized by the Tennessee Copper Co. The sulphuric acid plants of both companies have been designed along the most modern lines, with the purpose in view of obtaining the greatest possible product in the minimum space. Even then, though, they cover a large area and are of a height and size comparable with most of the big office buildings in any of the larger cities. The Ducktown Copper Co. tried the contact method of manufacture of sulphuric acid, but found it unsatisfactory, and, like the Tennessee Copper Co., they are now planning to make their sulphuric acid by the well-known and older lead-chamber process.

The Ducktown district is in the southern corner of Tennessee, in Polk county. The operations of the Tennessee Copper Co. and the Ducktown Copper, Sulphur & Iron Co. are situated only a few miles from the North Carolina line on the east and the Georgia line on the south. Prior to the completion of the sulphuric acid plant of the Tennessee Copper Co. the sulphur dioxide fumes resulting from the smelting of the sulphide ores (from which is obtained about 35 pounds of copper to the ton of ore smelted) were allowed to escape, and, being injurious to plant life, they played havoc with the vegetation for a number of miles around the sites of the two plants. This condition led to legal action being taken against the two companies by the State of Georgia, in which the plaintiff obtained, but only after a long contest, a favorable decision, rendered by Justice Holmes of the Supreme Court, in which, however, it was stated that the defendants, the copper companies, were to be given a sufficient time to eradicate the evil of which the farmers across the Georgia line complained.

As the best and only means of accomplishing this, the Tennessee Copper Co. undertook the construction of the sulphuric acid plant now in operation at Copper Hill, and the Ducktown Copper, Sulphur & Iron Co. followed suit by building the plant now going up at Isabella. Thus it happens that, in consequence of the decision of the Supreme Court, the manufacture of sulphuric acid in a sense became compulsory; and it is evident now that its manufacture, started as a by-product, is destined to prove extremely profitable. The utilization of sulphur dioxide fumes in this way, it is claimed, is a radical innovation in metallurgical practice, but, if it is, it is so only with regard to the metallurgy of copper ores, for it has been the practice for some years past to manufacture into sulphuric acid the sulphur dioxide fumes arising from smelting both lead and zinc ores, as, for example, at one or two or more smelters in Illinois and elsewhere.

The manufacture of large quantities of sulphuric acid gave rise in the Ducktown district to the problem of the best and most profitable means of disposing of this new product, and the logical solution of this problem is the present one, the conversion of the sulphur dioxide fumes into acid to be used in the manufacture of acid phosphate. Hence it is more than likely that the Ducktown Copper, Sulphur & Iron Co. will, as previously forecasted, organize, if, indeed, this is not now either quietly in process or an accomplished fact, a fertilizer company also. With an output of 1320 tons of acid per day, the quantity of acid phosphate that may be manufactured by the subsidiary companies of these two concerns will obviously be large, but it is doubtful whether it is a sane conclusion to presume that it will result in a very large reduction in the cost of fertilizer to the individual consumer. It is, however, fairly safe to say that there will be some reduction as compared with the existing prices of

the older companies, yet for economic reasons that need not be elaborated here this will be small in the instance of each farmer, though in the aggregate it may be large.

The construction of the acid plant owned and operated by the Tennessee Copper Co. was started in the early part of 1906 and was completed in 1907. The acid plant of the Ducktown Copper, Sulphur & Iron Co., on the other hand, began building during the present year, and should be completed some time during the spring of the coming year, if not earlier. Acid making was commenced about December 1, 1907, by the Tennessee Copper Co., and the plant has been in practically continuous operation since that time. The most serious difficulty met with, preventing the plant from reaching its full capacity, was the failure of the original blast furnace taps, due, according to a statement issued by the Tennessee Copper Co., to the excessive heat to which these taps were subjected under the method of operation best suited to the acid plant. Changes to the furnaces are now under way and will soon be completed.

In its essential features the plant is similar to the ordinary acid plant of the lead-chamber type, the main difference being the source of gas supply, which, in this case, is drawn from the concrete flue back of the blast furnaces in which are fluxed the copper ores. The plant consists of two Glover towers, 12 chambers, and four Gay-Lussac towers, all of unusual size, but performing the same functions as in the ordinary small-capacity plant.

The blast furnace gas is a mixture of the gases sulphur dioxide, sulphur trioxide, carbon dioxide, oxygen and nitrogen, but by far the greater percentage of the gas consists of sulphur dioxide. The other constituents are present in comparatively small amount. However, the actual percentages present are subject to considerable variations, and special methods of control are necessary to maintain a suitable gas.

The acid-making process consists of the formation of sulphur trioxide through oxidation of sulphur dioxide, and the union of the sulphur trioxide with water to form sulphuric acid. The combination of the sulphur dioxide and oxygen is brought about by the action of dioxides of nitrogen. These are derived from nitrate of soda by mixing a solution of the salt with sulphuric acid and subjecting the mixture to the action of the hot sulphur dioxide fumes coming directly from the furnace gas. The necessary water is added in the form of steam injected into the chambers. The salt (sodium sulphate) resulting from treating sodium nitrate with sulphuric acid is made use of as a furnace flux. Its sulphur dioxide returns to the acid chambers, while the sodium portion becomes in the furnace a constituent of the slag. The gases are drawn from the flue back of the furnaces and pass through the Glover towers, where nitrogen oxides are added to convert the dioxide to the trioxide, which, plus water, forms the compound known as sulphuric acid. After the gases leave the chambers they pass to the Gay-Lussac towers, the spent gases being conducted to the base of the main stack, and thence pass into the atmosphere.

The functions of the Glover towers are four in number: (1) To set free the nitrogen oxides from the Gay-Lussac acid; (2) to cool the furnace gases before they enter the chambers; (3) to concentrate the dilute acid made in the chambers to acid of shipping grade, which has a specific gravity of about 1.75; (4) and, lastly, by means of this concentration to furnish a part of the steam needed in the chambers. Incidentally, some acid is formed in this tower, the sulphur trioxide in the gases being absorbed at this point by combining in the water. The tower is constructed of heavy sheet lead, hung on a steel framework, the lead being protected on the bottom and sides by acid-resisting material, and the interior of the tower being filled with suitable packing. The Gay-Lussac acid and the weak chamber acid are mixed at the top of the tower and fed by a suitable distributing apparatus into the tower; the mixture flows over the tower packing, coming into intimate contact with the hot furnace gases.

The chambers are constructed of a lighter weight sheet lead than that hung on the steel framework of the Glover towers. Here again the sheet lead is hung on a steel framework so as to form immense boxes—the chambers—of sheet lead, entirely empty, except for the small amount of acid standing in the bottom. The sulphur dioxides, together with the oxides of nitrogen, enter the chambers at a temperature of about 212 degrees Fahr. Steam is injected at this point, and it is here that the acid-making process is completed, the acid condensing and collecting in the bottom of the chambers. The strength of the chamber acid is constantly under observation. Samples for testing are obtained by means of a drip-pipe leading from the interior of the chambers to a glass jar on the outside containing a hydrometer. The strength of the acid in the chambers is maintained at a specific gravity of about 1.58.

The principal function of the Gay-Lussac towers is the recovery of the nitrogen oxides from the spent gases before they are allowed to escape into the atmosphere. This is brought about by feeding strong acid from the Glover towers into the top of the Gay-Lussac towers, which are filled with a packing to insure contact between the acid and the ascending gas. The acid used for this purpose is first cooled, so as to render it more efficient. The acid coming from the Gay-Lussac towers, containing the nitrogen oxides in solution, is called nitrous vitriol. This passes over to the Glover tower with the weak chamber acid, the nitrogen oxides being liberated and passing again to the chambers to take part in the acid-making process. In practice complete recovery of the nitrous gases is impossible, a certain amount going to waste, which is replaced by the denitration of the fresh nitrate of soda, according to the reaction, $H_2SO_4 + 2NaNO_3 = 2HNO_3 + Na_2SO_4$.

At the Tennessee Copper Co.'s sulphuric acid plant the strong acid from the Glover towers passes to steel storage tanks, 10 in number, and having a total capacity of about 7000 tons. From these tanks the acid is drawn off and is thus loaded into steel tank cars, with a capacity of 55 tons each, for shipment to the consumer. With organization of the Independent Fertilizer Co., it is presumed that practically the entire acid output will be sent to points where this company locates its different plants, there to be used in producing the compound acid phosphate, which, because of its peculiarly useful and valuable properties, forms the basis and is, indeed, the main ingredient of the commercial fertilizers.

The smelting of the sulphide ores, in which the copper values occur, is apt to continue in the Ducktown district for a very long period of years, with ample room for expansion both in the matter of manufacturing acid and also in the production of copper matte and pig. This is because of the large tonnage of raw material which occurs in lenticular masses following three parallel lines of dislocation. The ores comprising these lenses for the most part are the sulphides—chalcopyrite, pyrite and pyrrhotite—with foot and hanging walls consisting of much-altered schists, the country rock being ancient schists and gneisses.

The example that has been set by the Tennessee Copper Co. and the Ducktown Copper, Sulphur & Iron Co. in the matter of disposing of sulphur dioxide gas in the smelt-

ing of sulphide copper ores will undoubtedly have a far-reaching effect. The Anaconda Copper Co. and other smelting interests at and near Anaconda, Mont., are reported to be experiencing the same difficulties and meeting with the same complaints, because of the alleged destruction by sulphur dioxide gas from their smelters of plant life over large areas in that vicinity. Their difficulties might, perhaps, be turned to profit were they to follow the example set by two copper companies of Polk county, Tennessee.

TENNESSEE'S BIG PHOSPHATE FIELD.

By W. D. HASTINGS.

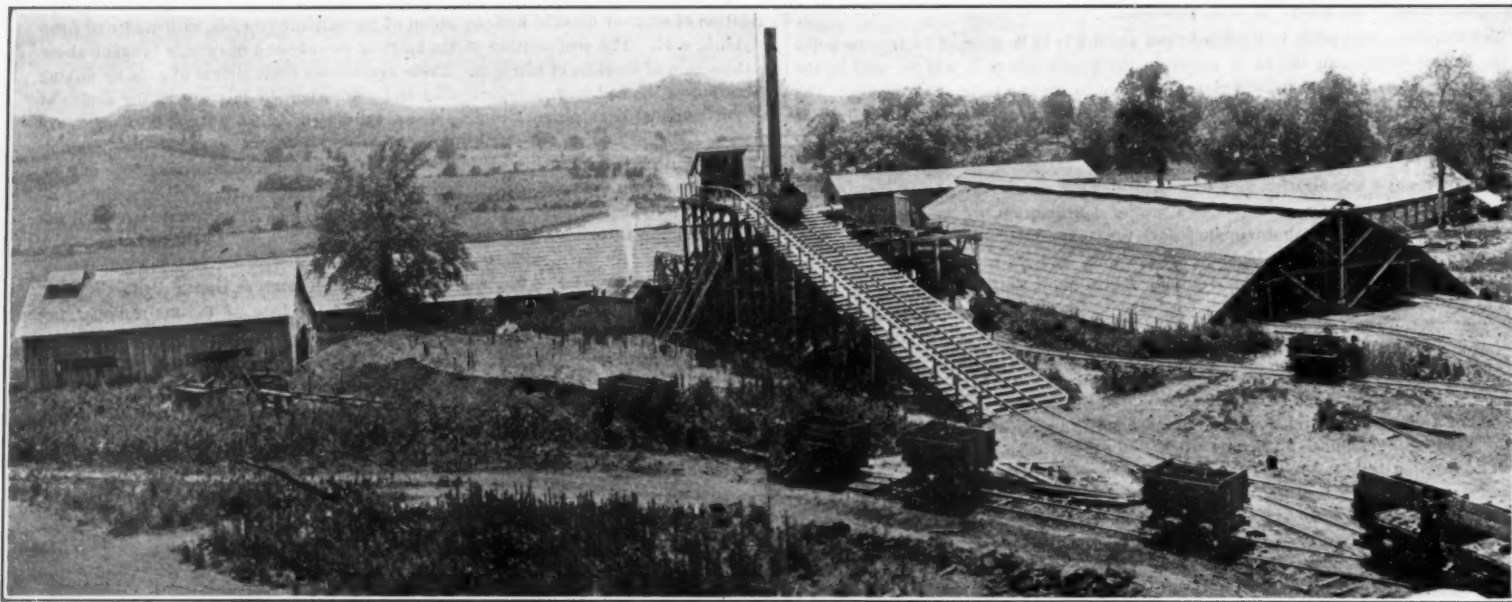
[Written for the Manufacturers' Record.]

Many histories of the discoveries of the phosphate field in Maury county have been written and printed in different papers and magazines of the country, and, while in a sense the histories were good and partially correct, the real beginning of the search for phosphate rock in Maury county and the cause leading up to this investigation have never been told. The public does not know what prompted these few men who commenced the investigation, and the facts have been known only to a few men in the county.

The first intimation of there being phosphate rock in this county or section was when William Shirley, a stonecutter of Columbia, dug the first hole in 1888 on Gholston's Hill, but a short distance from Columbia, and in the sinking of this hole there was revealed a rock that resembled phosphate. Shirley told what he knew of the matter to Dr. Safford, at that time State Geologist of Tennessee, and Dr. Safford made

thought they were getting in close proximity with coal. In sending a lot of samples one day to Professor Wharton, at Nashville, a sample of the blue rock, or "bloom," as they called it, got into the sack, and when the analysis was made it showed a 70 per cent. phosphate rock, with very little iron and alumina. This was in December, 1893, and mining was soon afterwards begun in many sections, but for the lack of transportation and sufficient capital to carry on the operations and the numerous parties holding properties and the vast amount of territory involved and the unfamiliarity with mining of any kind, the development was slow, and in many cases spasmodic. It required a great deal of money to mine the rock, and the price soon fell from \$4.25 per ton (which was the price received for the first car of rock from this field) to \$2.25. The shipment was made by the old Southern Phosphate Co., one of the first companies to organize. After the decline to \$2.25 per ton from \$4.25 many who had been mining ceased operations altogether and the mines were abandoned.

In 1896, at the time when negotiations were on foot for the sale of a large tract of blue rock on Swan Creek, S. Q. Weatherly, former judge of the County Court of Lewis County, while on a trip to Mt. Pleasant, discovered a peculiar rock of brownish color in the bank of a little branch along the roadside, and, being interested in minerals, picked up a piece and had it analyzed, by which it was proved to be 75 per cent. phosphate rock. Mr. Weatherly took a number into his confidence, among them being W. J. Webster of Columbia and Harry Arnold of Nashville. The matter was kept quiet for several days, until they had succeeded in securing a small tract of land—about 2½ acres—and the firm of H. I. Arnold & Company was formed, but this was not done until after the sale of the blue-rock tract was made. They bought the lot from Mumford Smith. They then began to mine rock, which was the first opening of the



PLANT NEAR MT. PLEASANT FOR HANDLING PHOSPHATE ROCK.

an analysis of the rock, and it was revealed that there was phosphate rock of fairly good per cent., but the quantity was lacking.

John Trotwood Moore also became interested in the matter with Shirley and endeavored to interest capital at Birmingham, Ala., in the matter, but failed to do so. It was during these negotiations for sufficient capital to back the scheme that an English geologist was sent here to make investigations, and he reported to his company that phosphate existed here, but not in sufficient quantities to be worked, and this resulted in the abandonment of the investigations for the time being, but, in spite of all these reports to the contrary, Shirley never wholly abandoned the hope of some day making a discovery that would make him rich, and never failed to talk of the matter whenever he could get someone to listen to him.

In 1893, while cutting one of the caps to a post on the rock fence for the Columbia Arsenal, Shirley was talking to H. A. Webster, then a small boy, about phosphate and was overheard by Harry Arnold, one of the contractors, who at once became interested in the story, as he had been reading up on minerals and their formations. This young Webster was with Shirley when he dug the first hole on Gholston's Hill, in 1888, and had ever since been anxious to hear Shirley talk of phosphate. This same H. A. Webster is the man who recently promoted and swung the \$7,500,000 phosphate deal which resulted in the formation of the Franco-American Consolidated Phosphate Co. Since the time of his first talk he has made a constant study of the business. Shortly after this talk with Arnold and Webster at the arsenal Shirley was crossing Knob creek and discovered a stratified deposit of rock, but it was of the kidney and shale specimen and not of sufficient quantity to work. The sample was brought to Columbia, and Major W. J. Whitthorne saw the specimen and it brought back to his memory a similar rock that abounded in quantity at a certain place in Hickman county, on Swan Creek, at which place he had crossed the creek going to and from Columbia to Newburg.

The announcement of this fact set the whole section to work, and options were taken on every acre of land that could be secured. Other discoveries were made in rapid succession. Dr. Gallinger of Nashville was the man who discovered, through analysis, phosphate existing in the kidney formations, which is one of the highest grades of rock found in this section of the country. Dr. Gallinger, Major Whitthorne and Harry Arnold then began a systematic search for the rock and found it in abundance and of great commercial value on Upper Swan Creek, in Hickman county. About the same time this deposit was found in Hickman it was discovered on the same creek by Bates and Childs in Maury county. The rock discovered by Bates and Childs was the blue rock, and was rather an accident. They had repeatedly sent in specimens of rock of the slaty, shale formation for analysis. This slate is invariably in existence where the blue rock is found, and is a covering for the phosphate strata. They had

Mt. Pleasant field proper, which proved to be the biggest and finest district of the whole field.

By this time the manufacturers of fertilizers had brought the price down to \$2.25 per ton, and it was finally run down to \$1.25 and \$1 per ton, which was a common price. The mining almost ceased and the fields were abandoned, and 1897 John S. O'Neal, in a paper prepared and read before the Engineering Association of the South, said: "The owner of a bed of phosphate rock is not as well off as the owner of a sand-bank, given the same proximity to market."

Fortunately for the country, some of the poor fellows in the phosphate business could not get out and kept digging away, until gradually capital decided that it was worth buying, and as a result \$3,000,000 has been paid for property in the Mt. Pleas-



A PHOSPHATE MINE OPENING.

ant district, about \$1,000,000 in other portions of Maury county, and over \$2,000,000 for property in the counties of Decatur, Perry, Lewis, Hickman, Giles, Williamson, Davidson and Sumner counties, and the price has gradually advanced until now export rock sells for \$6 per ton; from that on down to \$3.75 per ton, which is about the lowest price paid for domestic. As the price has increased, the cost of production has proportionately increased, and this has reached the value of more than \$1,000,000 per

annum paid out for labor alone. To some extent this was cut down in the panic of 1907 and has not fully regained its usual amount.

There is one thing that is peculiar in the phosphate business, and a stranger, upon visiting the mines, is at once struck with it, and that is the mode of mining. There have been vast improvements made in the methods of handling the rock after it is mined, but no method has ever yet been installed that is an improvement over the pick and shovel, except in the case of the blue rock, that has to be drilled and blasted. In the early mining of the rock it was carried through a system of washers to clean the muck and dirt off; that has been abandoned in almost all cases. A system of driers are used which enables the miners to separate the dirt from the rock at almost half the former cost. The separation is made by a system of screens. The Century Phosphate Co. was the first company to install these new methods.

Since the opening of the mines in Maury county many miles of railroad have been built by the Louisville & Nashville Railroad and by private parties. And there is now in course of construction a railroad from Franklin, Tenn., to Leatherwood, in Hickman county, which opens up one of the richest fields of phosphate in the district. In addition to this, there have been built several miles of road in Hickman, Perry, Wayne and Lewis counties. The Nashville & Chattanooga Railroad operates in Hickman county and has built several miles of track. Following is a table showing the shipments from 1894 up to and including 1907:

Year.	Long tons.	Value.	Year.	Long tons.	Value.
1894.....	19,188	\$67,158	1902.....	454,078	\$1,341,161
1895.....	38,515	82,160	1903.....	445,510	1,434,660
1896.....	26,157	57,370	1904.....	540,000	1,944,000
1897.....	128,723	192,115	1905.....	482,859	1,632,388
1898.....	308,167	498,392	1906.....	547,677	2,147,991
1899.....	462,551	1,272,022	1907.....	638,612	3,047,836
1900.....	450,556	1,352,568			
1901.....	394,139	1,186,033	Total.....	4,859,901	\$15,920,636

These figures are taken from the United States Government report and are considered accurate. It will be seen in the table that there was more rock shipped in 1902 by 8568 tons than in 1903, but there is a difference of \$93,499 in favor of 1903, which year was one of the banner years of phosphate since the Mt. Pleasant fields were opened. Rock was in great demand and was selling for good prices.

The principal localities in the State where operations are now in progress are as follows: Mt. Pleasant, Cleburne, Jameson, Century, Carter's Creek, Godwin, Ashwood and Ridley, in Maury county; Lower Swan Creek, Twomey, Centerville and Totty's Bend, in Hickman county; near Gallatin, in Sumner county; Wales Station, in Giles county, and near Nashville, in Davidson county, and in and around Franklin.

The principal localities where developments will take place as the demands of the business require are: Southport, Estes Bend, Bear Creek, Neeley's Valley, Little Bigby, West Fork, Baptist Branch and Leiper's Creek, in Maury county; Richland Creek, in Giles county; Station Camp Creek, in Sumner county; Brentwood and Bellview, in Davidson county; Beech River, in Decatur county; Tom's Creek, Buffalo River, Hurricane Creek and Cane Creek, in Perry county; Forty-Eight-Mile Creek, in Wayne county; Upper Swan and Indian Creeks, in Lewis county; Lower Swan, Indian Creek, Ship's Bend, Gray's Bend, Persimmon, Haley's and Leatherwood Creeks, in Hickman county.

The blue-rock field has not been mined as steadily as the gray and brown-rock fields, and as a consequence there are millions of tons that have been prospected which are of the highest grade, but never mined, and the territory covers a vast area, with four corners, as follows: Centerville, in Hickman county; Kinderhook and Mt. Joy, in Maury county, and Lewis Monument, in Lewis county. There are flowing through this field of blue rock Duck River, Indian, Swan, Buck, Cathey's and Blue Creeks and their tributaries, and outcropping in these valleys and under the ledges and between them are deposits of blue rock running in bone phosphate from 60 to 78 per cent., with less than 3 per cent. iron and alumina, that will aggregate in the neighborhood of 40,000,000 tons. These figures and this report are taken from a report gotten up by H. D. Ruhm, of Mt. Pleasant, one of the leading phosphate engineers and miners in the State. I give the following analysis made by Mr. Ruhm several years ago, which is a complete analysis of a dry sample of brown rock:

Moisture.....	.87
Combined water and organic matter.....	1.53
Sand and insoluble matter.....	2.76
Peroxide of iron.....	2.40
Alumina.....	1.99
Lime.....	49.07
Magnesia.....	.24
Carbonic acid.....	1.08
Equals carbonate of lime.....	2.41
Fluorine.....	2.98
Sulphuric acid.....	1.03
Phosphoric acid.....	35.62
Equals bone phosphate of lime.....	77.78
Total.....	99.57

There are now about forty chartered companies in this district, but not all in operation, and they represent an acreage of considerably over 100,000 acres of rich phosphate lands, valued at about \$1000 per acre, or a total of \$100,000,000, with a phosphate value of from \$5000 to \$10,000 per acre of mined rock.

In Maury county where the mining is done the land is left in a rather rough condition, and in some instances looks as though it would be ruined for farm purposes, but wherever it has been cultivated it has proven to be in better condition for farming than it was before the rock was removed from the ground.

There have also been erected more than a dozen large fertilizer plants in the district, among the latest ones erected being the Mt. Pleasant Fertilizer Co., at Mt. Pleasant, Tenn.

The Century Phosphate Co. has closed down its plant for the purpose of overhauling and putting in new and more modern machinery, and will be ready to resume operations about the first of January, as will also a number of other plants which have been closed on account of the panic of last year. They have been kept busy this year disposing of the surplus rock they had on hand when the panic came. Indications point toward one of the biggest years in the history of the phosphate business for 1909.

Columbia, Tenn.

*Blue rock.

Activities Centering in New Orleans' Growth.

[Special Correspondence Manufacturers' Record.]

Bureau of the MANUFACTURERS' RECORD,

1012 Maison Blanche,

New Orleans, La., Dec. 31.

In the transition from the rural and provincial to the elegant and urbane—the process every city has had to pass through, from ancient Rome and London to modern Chicago and Spokane—there has been more progress made in New Orleans during the decade last passed than in all the previous years of her existence. True, conditions have been different here from those in other cities of America's pioneer days, for at New Orleans, from the very period of her settlement, nearly 200 years ago, these have been a gracious people, with a charming civilization and rarely engaging features of social and domestic life. The boorish and the crude have ever been absent from the dominant New Orleans character, and even before the days of sidewalks, or "banquettes," when the New Orleans beau almost literally and daily repeated the gallantry of Raleigh in spreading his mantle in the mire that his queen might cross dry-shod, there was a gentleness and refinement among the people who had come over to establish themselves here that distinguished New Orleans above well-nigh every city of the South, and of the whole United States as well. Till time shall be no more the romance, the chivalry, the charm of the pleasure-loving, carnival-creating, princely-entertaining and altogether delightful people of New Orleans will be a cherished heritage of the new world and a theme and inspiration for the writer of the story and the song.

But with this charming individuality there was, likewise, aloofness toward the peoples and conditions of elsewhere. Like some imperious queen, the Crescent City of the South had gone her majestic way, with little heed to what others might do or say. Here was a city breathing the spirit of a romantic past, and in every physical lineament bearing a reminder of an age long gone. The architecture of the business houses and the homes was mainly of a quaint and curious type, suggestive of the Spanish and Moorsque; the streets that were paved at all had cobblestones or huge blocks of Belgian granite, brought from across the sea as ballast for ships; there was no system of sewerage, and practically all the water of domestic use was cisterned rainwater from the houses' roofs.

Within a decade the changes that have come amount to a revolution. The gigantic work of completely sewerage and draining the city and of providing a water-works system with capacity to serve more than a million persons is now practically accomplished; there are 245 of the 500 miles of the city's streets now paved, 55 miles of them being asphalt; steel and concrete skyscrapers dot the horizon, and mansions adorn the residence streets. A municipally owned and operated belt railroad taps all the lines entering New Orleans and will solve the problem of cheapening the cargo transfer charges between the shore and the ship; nearly every railroad entering the South is either in New Orleans now over its own lines or through traffic arrangements with others; an unparalleled system of public wharves, with store sheds, has been established; the steamship service with the outside world has been vastly facilitated by the opening of the Southwest Pass, dredged and jettied for a 35-foot depth over the bar, and there is alertness to the value and co-operation in the work of securing a Lakes-to-the-Gulf deep waterway and an intercoastal canal from New Orleans to the Rio Grande. A realizing sense of the manifest destiny of New Orleans as one of the greatest ports of the world dominates public and official action, and in commerce and finance, expansion and preparations are in line, with the expectation that within a few more years there will be a million persons here, with even a greater growth to come.

And with all that is being done, it cannot be charged that New Orleans is going ahead too fast, or is treating itself with hothouse methods. There is food for reflection in a recent comment by the San Francisco *Argonaut* on the ambitions of some to see that city quickly acquire a place in the million-population class. Said the editor:

"The *Argonaut* takes snail interest in municipal boosting schemes. Better give our energies to promoting orchard development, the sugar-beet industry, potato growing, manufacturing, large and small, throughout the interior, rather than to million clubs and such like projects. San Francisco will have a million people when the general activities of the State call for a million workers in its metropolitan city, and until that time we shall have no use for a million people and would be infinitely worse off with than without them."

While it is true that there is much to be done in the way of developing the marvelous resources of Louisiana, and that compared with what may be cultivated the area of farm lands is lamentably small, yet there is a notable tendency toward development in every line, and Louisiana is conspicuous among Southern States in the favorable attitude of her governing bodies toward enterprise and progress. Her laws are mainly fair, and her officials are advocates of development. With such a disposition as a recognized State policy, there is an increasing investment by outside money in enterprises and undertakings hereabouts. The enormous investment of New York money by the Great Southern Lumber Company in a mill and town at Bogalusa was made in Louisiana, instead of elsewhere, because of the favorable laws of Louisiana. In Louisiana there have also been other millions invested recently in sawmill operations, notably at Longview and Fullerton, so that Louisiana greatly leads the South in the amounts invested in recent years in sawmill enterprises.

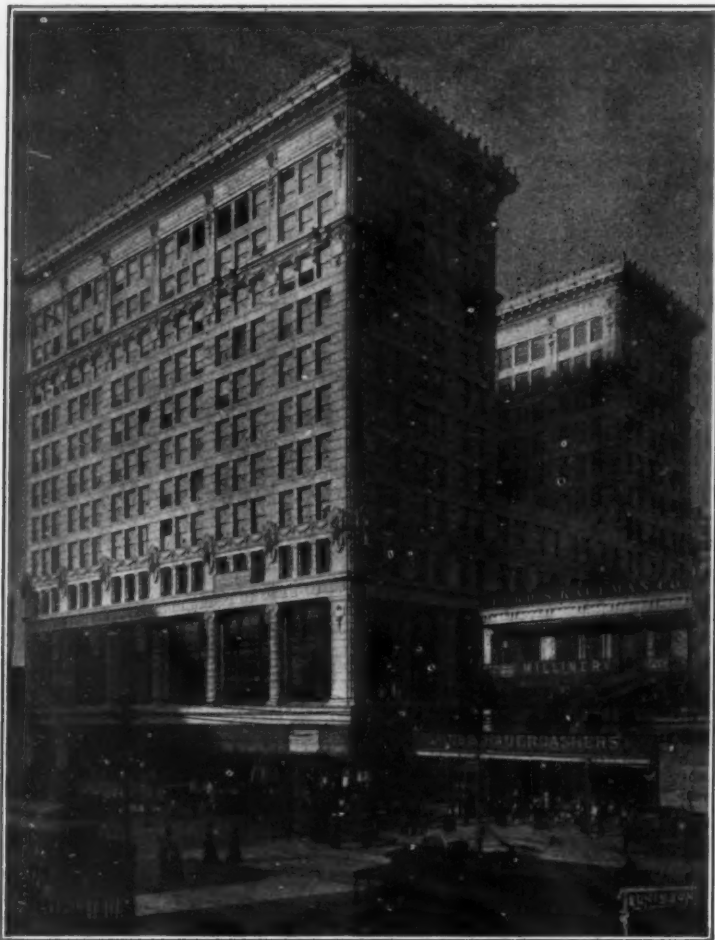
With such hostile legislation as has been passed in some other States, the \$5,000,000 investment of the American Sugar Refining Co. in an enormous new plant would not have been made at New Orleans, nor would the Standard Oil interests be now figuring on a pipe line from Oklahoma, via the Caddo oil field of Louisiana to New Orleans, with a huge new oil refinery in contemplation here. Absence of hostile legislation has made possible the development of the great sulphur mines near Lake Charles, until Louisiana now supplies practically all the sulphur the United States requires and dominates the sulphur market of the world. Louisiana's wonderful salt deposits have likewise been profitably developed to the vast advantage of the whole South and the addition of one more element in the growth and importance of the commerce of New Orleans.

In agriculture, in orange growing, in truck farming, in dairying and in the development of all the resources of Louisiana there remains much to be done; but there is progress being made in some degree in all these lines all the time. Louisiana's rice crop is now worth \$7,000,000 a year, and, with New Orleans already the leading rice market in the country, there will be greater developments in this industry as a greater

market is developed for American rice. In addition to the phenomenal development of the rice industry in the Crowley district of Louisiana, the operations of the Union Irrigation Co. in St. Landry Parish, work on which has been commenced, will make it possible to enlarge the rice-producing area by thousands and even hundreds of thousands of acres.

The sugar crop of Louisiana now averages \$35,000,000 in value every year and is a wonderful stimulation of industrial activity all through the Union. It has been

ana, with further vast benefits to the city and State. That improved methods will come in the cultivation of the crop, notwithstanding the sugar planter is already the most highly organized, intelligent and businesslike agriculturist in the world, and that the utilization of bagasse for papermaking, the process for which has now been about perfected, will give a new source of profit to the planter seems a probability, so that the industry is likely to prove more attractive in the future than even in the past, yet it is held to be impossible to bring about any overproduction of the staple, since the de-



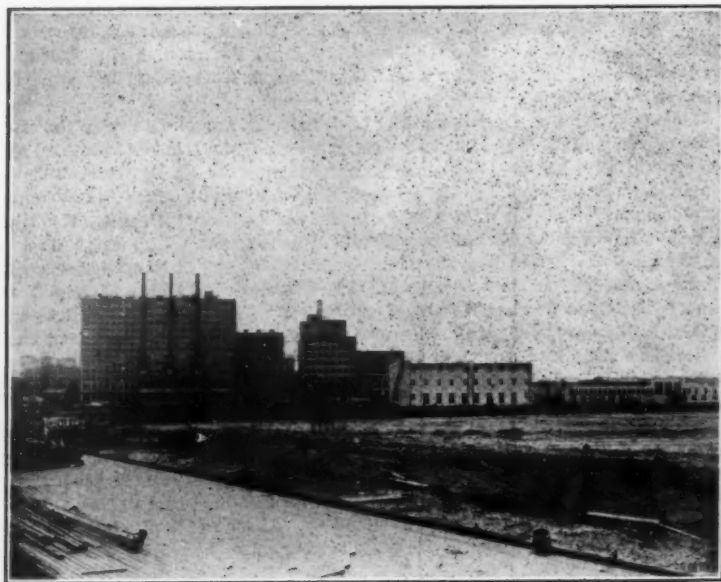
THE MAISON BLANCHE.

figured that all of \$60,000,000 of interstate commerce is created annually by this one industry through the purchases in the North, East and West of machinery, clothing, horses and mules, and the supplies of every sort that enter into the equipment and operation of the sugar plantations and the living necessities of the owners and their employes. Practically all of the home-grown cane sugar is produced in Louisiana, the development in the Brownsville district of Texas not yet having grown to large proportions, and yet of the 7,000,000,000 pounds of sugar consumed in America last year the



CANAL-LOUISIANA BANK BUILDING.

mand keeps up with any increased supply, and the amount brought from foreign countries is so hugely out of proportion to the present production here. As always with mankind, the Louisiana sugar-planter seldom confesses to the attractiveness of his vocation, but he testifies to the hazardous nature of his calling, and he lives in terror of a reduction in duty on sugar. It is the belief of some students of the matter that if sugar were admitted free there would be an adjustment of methods of production that would still leave it possible for the competent and thrifty to prosper; but almost no



REAR VIEW NEW SUGAR REFINERY.

American cane-sugar product amounted to but 544,000,000 pounds, and, over and above the beet-sugar product of this country and the cane sugar from our island possessions, there was required from foreign countries 4,367,000,000 pounds. Surely, with the showing thus made of the enormous sugar-consuming capacity of the American people, with the nation-embracing benefits the industry confers and with the millions of acres of reclaimable wet lands in Louisiana, ideally adapted to sugar raising when fitted for cultivation, there must be a vast increase in the growing of cane sugar in Louisiana.



CASA GRANDE APARTMENT-HOUSE.

one who thinks the matter out can come to the conclusion that the Government, with any party in power, would feel like depriving itself of the handsome revenue collected on sugar, a tax so easily levied and a burden so universally and lightly borne. And thus it is deemed safe to assume that the sugar industry of Louisiana will vastly expand, rather than suffer any decline, whatever may befall.

Recent developments in the vicinity of Shreveport, together with the great productivity of the Jennings oil field and the striking of a tremendous gas well on the

Lower Lafourche, have attracted much attention in the outside world to the oil and gas possibilities of Louisiana. How much of the State is underlaid with gas and oil it will be impossible to say, of course, before sending down the drill. Some opinions are to the effect, however, that enormous quantities of both oil and gas will be found here, and that the area is of wide extent. At any rate, enough has already been determined to justify the piping of gas to New Orleans, and capitalists are said to be looking into

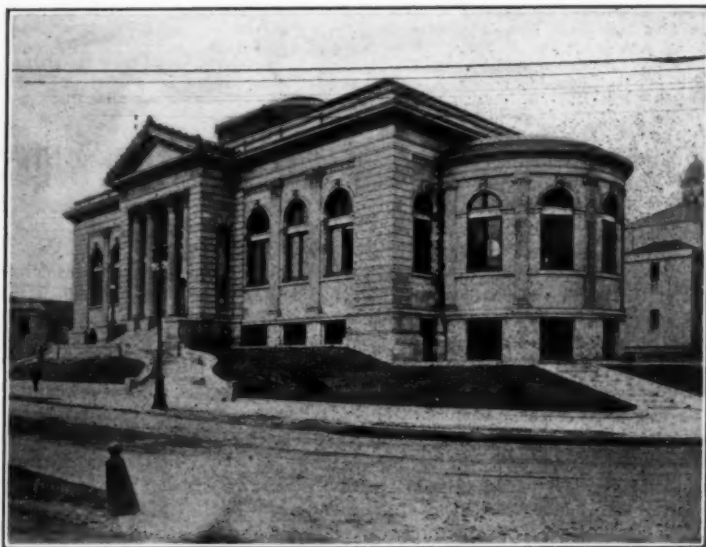
for investment in industrial lines, as well as stimulate local men and money to further activities.

The spirit of development that now permeates New Orleans manifests itself most strikingly and at once in the new buildings that are to be seen; and in proportion to population there has probably been as great a development here in the line of steel and reinforced concrete buildings as in New York itself. Nevertheless, significant and spectacular as are the new skyscrapers of New Orleans, there is nothing in the way of private enterprise that at all compares in importance, in advancement or in the evidence of awakening civic pride and sympathy with modern progress which it reveals, with the municipal enterprise of providing an adequate system of water-works, drainage and sewerage for New Orleans. In the face of extraordinary physical conditions,



PERRIN BUILDING.

the matter with the intention of undertaking the work. In view of the discoveries on the Lower Lafourche, only some 40 miles from New Orleans, where a gas well has been spouting for months until a huge crater has been formed, it would seem unnecessary to go so far as Shreveport for a gas supply, but in any event it is considered highly probable that gas fuel, even for manufacturing, will be available for New Orleans before so very long. Already excellently conditioned as a manufacturing cen-



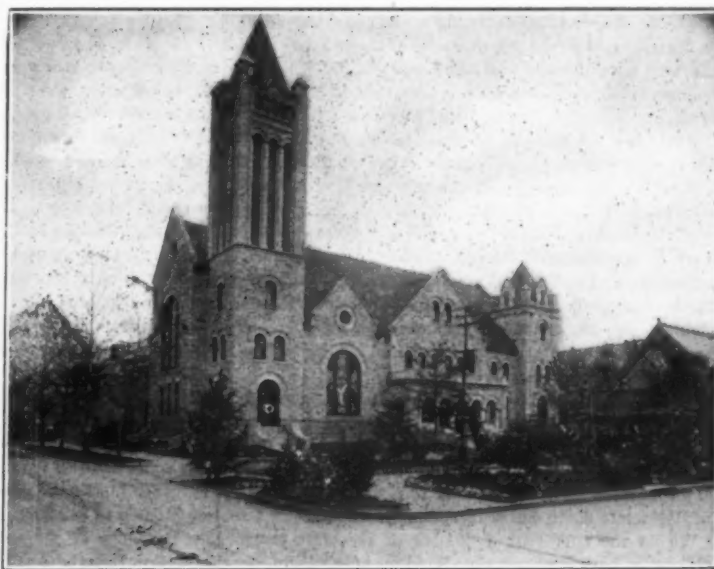
PUBLIC LIBRARY.

ter on account of ease and cheapness in assembling raw materials, facilities for distributing the finished product and abundance of labor, New Orleans, with natural gas, would certainly experience an industrial development that would take on proportions somewhat in the nature of a boom. While there has been a considerable growth of manufactures here in recent years, there is a vast field still unoccupied, and natural gas would doubtless provide the occasion for a considerable influx of outside capital



GRUNEWALD HOTEL.

on account of the low-lying character of all the city territory, all of which is below the level of high water in the Mississippi and much of which is below the level of Lake Ponchartrain and the Gulf, there has been installed a drainage system which has lowered the water table an average of six feet or more throughout the city, making hith-



FIRST BAPTIST CHURCH.

erto unheard of cellars and basements an easy attainment and providing for the removal of frequent torrential downpours of storm water within an hour two of its fall. The comprehensive system of sewers also covers the inhabited portion of the city, and the up-to-date water-works plant is laid out on lines that will give it capacity for a city four or five times New Orleans' present size.

The drainage construction was begun in 1897. By 1900 it had gone into operation

sufficiently to show what it would do, and in that year the death rate dropped six per thousand, and has stayed down ever since. In addition to 50 miles of subsurface drainage pipes, there are 100 miles of drainage canals; 20 to 25 miles are now masonry lined and covered over; 50 or more miles will have to be treated in like manner, as the population increases, and the others will remain as outfall canals, unlined. A number of huge pumping plants relift the water, which ultimately reaches Lake Borgne.

Sewerage construction was started in 1903. Today there are 300 miles of sewers built, serving the 13 square miles of territory included in the area at present covered by sewers and water mains. The change from cesspools to sewers will, of necessity, be a gradual one. By the provisions of the law, the city is compelled to make house connections. At present there are not sufficient available funds. About 3000 house connections have been made to date. Out of the fund to be secured by an \$8,000,000 bond issue funds will be available for purposes such as these, and it is anticipated that from 3000 to 4000 connections a year will be made thereafter.

The new water-works system was begun in 1905. It has cost \$7,000,000 to date. Its present capacity is 50,000,000 gallons a day. The plant covers eight city blocks, and enough property has been acquired to give room for development up to 150,000,000 gallons capacity, sufficient for a population of 1,500,000. Five hundred miles of water mains have been laid. The pressure has been on the mains all over the city for some time, and the filtration plant was scheduled to be in operation January 1. The construction machinery and plans of water, drainage and sewerage system are on the best modern lines, and when completed New Orleans will be in as fine shape as to water-works, as well as to sewerage and drainage, as any city in the country. As a matter of fact, it is practically so now, and it gives the informed Orleanian a jar to hear the people of cities and towns in the Ohio River Valley and elsewhere, who take skiffs at the second-story windows whenever a freshet comes, express much solicitude for the people of New Orleans, when they would hardly know there was a flood stage in the Mississippi if they didn't read of it in the newspapers.

About \$18,000,000 has been spent on water-works, drainage and sewers, and an additional issue of \$8,000,000 bonds is to be effected soon, which will be spent at the rate of about \$2,000,000 a year during the next four years. Ultimately, and as the city grows, it will require an additional expenditure up to \$35,000,000 or so to serve the 31 square miles included in the district generally regarded as the New Orleans municipality. Although the city has jurisdiction over the entire Parish of Orleans, with its more than 100 square miles, it will manifestly be a long time from now before it will be necessary to cover any larger area than the 31 square miles with water mains, sewers, etc.

Within five years some \$2,100,000 worth of street paving has been done by the city, and bids have recently been opened for the paving of 40 additional streets at an approximate cost of \$2,300,000. Canal street has been paved with asphalt its entire length, from the river to Metairie Ridge, some four miles, and the famous St. Charles avenue has been paved for practically its entire length with asphalt. Some of the most recently paved streets have granitoid, or cement, and this material will be used on a number of the streets to be paved soon.

In many of the recently constructed buildings cement has been used, either wholly or in part. All the floors and the roof of the American Sugar Refining Co.'s buildings are of reinforced concrete. The wharves of the \$4,000,000 Frisco sheds and slip, at Chalmette, are of concrete, as is the fireproofing of the Stuyvesant docks, except for the Bedford limestone facades. The new passenger station of the New Orleans Terminal Co. is of concrete and steel construction. An enormous amount of reinforced concrete has been used in the construction of the new water-works, practically everything except the pump-house being of this material. A flour mill and the new home of the Delta Bag Co. are of reinforced concrete, and a notable example of recent construction is the Casa Grande apartment-house. This is a four-story building, the walls, floors, roof and stairways of which are reinforced concrete throughout. It is the first building of its kind here, and represents an investment, ground and all, of \$125,000. It was built according to plans of MacKenzie & Biggs and Emile Weil, New Orleans, by the Ferro-Concrete Construction Co. of Cincinnati, and is the most advanced attempt yet made to furnish New Orleans with a modern apartment-house. As disproving the theory long held, that New Orleans people could not be interested in the apartment-house idea and that flats here would not be occupied if built, it is worthy of note that the principal owner and promoter of the enterprise, A. Aschaffenburg, is a New Orleans born man and one who has been identified with three of the only five or six flat buildings constructed here to date; also, that all but 2 of the 27 apartments in the Casa Grande are occupied, nearly all of them on a three-year lease, signed up before the building was much more than begun. The work on the building was started May 1, and the tenants began moving in October 1, five months from the time ground was broken.

Other notable examples of concrete construction are shown in the beautiful new edifice of the First Baptist Church, 80x130 feet, outside dimensions, with a graceful tower 125 feet high. This building is of concrete blocks, made in New Orleans by the American Manufactured Stone Co., which owns the Ferguson (Denver) patent rights for New Orleans and several adjoining parishes. "Ferguson patent two-piece wall construction" is the description given by the architect, and in finish and tone of color a strikingly pleasing effect has been secured. The cost of the structure was \$60,000. The interior arrangements for church and Sunday-school are spoken of as superior to those of any Baptist church in the South.

Francis J. MacDonnell, the architect, is making a specialty of such construction now, following the success in the case of the church, the first building erected here by the process named. A three-story store building, costing \$12,000, and two two-story residences, costing \$6000 and \$7000, have been completed, with walls of these blocks, and a four-story residence is under way, to be constructed of Ferguson blocks and reinforced concrete floors and roof, making it fireproof, at a cost of \$10,000 to \$12,000.

Within the past year a number of the most conspicuous examples of the new architecture have been completed and occupied, including the Maison Blanche department store and office building, the Grunewald Hotel annex, the Monteleone Hotel, the Public Library and the City Hall Annex, all of steel construction. Others, like the Canal-Louisiana Bank building, the St. Charles Hotel annex, the Hibernia Bank building and the Perrin building, also of steel, are of recent construction. The new million-dollar courthouse is under construction, and among the conspicuous new buildings to be erected in the immediate future is the million-dollar office and bank building of the Whitney-Central Bank and the million-dollar postoffice and Government building. Altogether, a period of five years' building activity—the past four years and the

year to come—will show a total of some \$20,000,000 investments in the more important new construction work here.

Buildings Recently Completed.

MAISON BLANCHE—Thirteen-story-and-basement department store and office building; steel, concrete, stone and terra-cotta; basement contains complete heating, lighting, refrigerating, ventilating and power plant; six lower floors occupied by store; next six, offices; thirteenth floor, attic purposes; 160x200 feet, exclusive of six-story annex 60x100; Stone Bros., architects; cost \$1,500,000.

GRUNEWALD HOTEL ANNEX—Fourteen stories; steel and concrete, with reinforced concrete floors, and entire steel work, columns and all, fireproofed with concrete; white-enameled terra-cotta exterior; 400 guestrooms; imposing rotunda; cost \$1,000,000; Toledano & Wogan, architects.

MONTELEONE HOTEL—Eleven stories; steel and concrete, and same construction as Grunewald; 97x118; 221 rooms; built in record time; foundations begun November 15, 1907; first room occupied December 1, 1908; cost \$650,000; Toledano & Wogan, architects.

PUBLIC LIBRARY—90x180 feet; Bedford limestone outside; steel frame; two stories high; steam heated; electric lights; elevator service; scagliola columns; oak inside trimmings; ornamental-plaster cornice; slate roof; building about 50 feet high; cost \$300,000; Diboll, Owen & Goldstein, architects.

TOURO SYNAGOGUE—Pressed brick and terra-cotta; tile dome roof; steel construction; concrete and pile foundation; ornamental-plaster interior; cost, approximately, \$100,000; Emile Weil, architect.

DELEGADO MEMORIAL ANNEX TO CHARITY HOSPITAL—Five-story steel, pressed brick and terra-cotta structure; cost, approximately, \$200,000; Crosby & Henkel, architects.

CITY HALL ANNEX—Six stories; concrete, pressed brick and terra-cotta; cost \$400,000; Diboll, Owen & Goldstein, architects.

WEIS BUILDING—Gravier street; four stories; brick, terra-cotta and stone trimmings; dimensions 70x112; cost \$78,000.

AMERICAN PAINT WORKS—Five-story brick structure; cost \$62,000.

AMERICAN CAN CO. BUILDING—Three stories; brick; \$43,000.

CASA GRANDE APARTMENT-HOUSE—St. Charles avenue; four stories; reinforced concrete; cost \$125,000; MacKenzie & Biggs and Emile Weil, architects.

RICHARDSON MEMORIAL—Tulane Campus; five stories; 40x240 feet; cost \$154,000.

RICHARDSON MEMORIAL DORMITORY—Tulane Campus; four stories; rooms for 52 students; brick with stone trimmings; cost \$37,000; DeBuys, Churchill & Labouisse, architects.

ST. VINCENT'S ASYLUM ANNEX—Two stories; brick; cost \$9000; DeBuys, Churchill & Labouisse, architects.

PYTHIAN BUILDING—60x160; seven stories and basement; pressed brick front, trimmed with terra-cotta; steel frame; gypsum-block partitions; reinforced concrete floors; tile roof. The building will have stores on the first story, opera-house on the next two stories, and offices and lodgerooms in the balance of the building; cost \$195,000. This is noteworthy as indicating the thrift of some of the Southern negroes, this being a colored lodge. The money for the building was raised by small contributions given by the colored people of the South; Diboll, Owen & Goldstein, architects.

Buildings Under Construction.

NEW COURT BUILDING—Royal and Conti streets; four-story reinforced concrete, stone, terra-cotta and granite building; cost \$1,097,000; to be completed by March 1, 1909; Brown & Brown, architects; P. Thornton Marye, Atlanta, associate architect.

CORDILL BUILDING—Canal street; five stories; mill construction; terra-cotta front; dimensions 29x169; approximate cost, \$50,000; Toledano & Wogan, architects.

SCHIFF BUILDING—Canal street; mill construction; four stories; dimensions 29x160; cost \$40,000; Toledano & Wogan, architects.

MONTELEONE POWER-HOUSE—Blenville street and Exchange alley; three stories; brick, steel and timber; dimensions 35x128 feet; Toledano & Wogan, architects.

In Immediate Contemplation.

Fourteen-story Whitney-Central National Bank building; steel, concrete, stone and terra-cotta; approximate cost, \$1,000,000; dimensions 50x210 feet; Emile Weil, architect, associated with Clinton & Russell of New York. Bids will soon be invited.

U. S. Government building, to cost about \$1,000,000.

Four-story reinforced concrete store and warehouse for H. T. Cottam & Co., to cost \$125,000; Crosby & Henkel, architects. Plans will soon be on the market.

Five-story brick and terra-cotta office building for New Orleans Real Estate, Mortgage & Securities Co., on Canal street; dimensions 37x150; DeBuys, Churchill & Labouisse, architects. Plans now being prepared.

New office building, Crescent City Slaughter-House & Stock Yards Co.; Stock Landing; two stories; brick; dimensions 80x100 feet; plans being prepared; DeBuys, Churchill & Labouisse, architects.

Marine Barracks and Officers' Quarters, United States National Station; barracks 200 feet long; appropriation, \$50,000.

B. Rosenberg Sons' four-story store building; mill construction; dimensions 75x145 feet; Emile Weil, architect. Plans will soon be on the market.

Four-story building for B. Rosenberg; dimensions 32x100 feet; brick and frame, with pressed brick front; Emile Weil, architect; plans now being prepared.

Six or eight-story bachelor apartment-house, Carondelet and Lafayette streets, to be erected by W. T. Coats. Architect has not yet been selected.

Six-story apartment-house, reinforced concrete, on St. Charles street and Lee circle; to cost \$50,000; Diboll, Owen & Goldstein, architects.

ALBERT PHENIS.

CONCRETE IN SOUTHERN CONSTRUCTION WORK.

By WILLIAM H. STONE.

[Written for the Manufacturers' Record.]

Cement is playing an important part as a leading structural material in the development of the South and Southwest. The great activity in all lines throughout those sections came at a time when the cement industry has been enjoying its greatest growth. In fact, it may be said that the growth of the cement industry has been somewhat typical of Southern development. This industry had its real start about 1880, when 42,000 barrels were produced. It was about this same time that the real rehabilitation of the new South started. Even as this industry has continued to expand by leaps and bounds each succeeding year, so has the South developed in all lines of endeavor. Today cement is recognized as a leading and important factor in all construction work, and so the South is looked upon as one of the most important and ever-expanding industrial and commercial sections of the country.

The broad development of the cement industry since 1880 and the many and ever-increasing uses for which the material has been found of the greatest practical value has been recognized and taken advantage of by all parts of the South. Architects, engineers and contractors are using cement for widely diversified structural purposes. In the building of industrial plants of all kinds, the improvement of transportation facilities, in water-power development, the construction of drydocks, seawalls, sewerage systems, water-works, steamship piers, bridges, viaducts, buildings of every kind and on the farm cement has demonstrated its diversified practicability.

Great quantities of cement are annually consumed in the South and Southwest, and

this consumption is continually widening and increasing. The South today, by reason of its many vast undeveloped natural resources and opportunities for the establishment of industrial plants of most every kind, is holding out to investors possibilities unequalled by any other section of the country. Capital, which is always seeking investment in such sections, is becoming more and more acquainted with the South's potentialities and its splendid opportunities for economical manufacture. Millions of dollars are being placed annually in these undertakings, and such investments are greatly increasing each year as the South becomes wider and better known. Coupled with these private enterprises are many public improvements of a large nature being undertaken or planned by the National, State and municipal governments. These include the improvement of harbors and rivers, the latter involving the construction of many locks and dams, large irrigation projects, the construction of numerous public buildings and army and naval depots by the National Government; the improvement of highways, involving the construction of many bridges, culverts, etc., by the State governments, and the paving of streets, the building of sewerage and water-works systems and the erection of public buildings by hundreds of cities. All of these public and private works involve an outlay of many millions of dollars annually; it having

materials available in this country for the manufacture of Portland cement, but it is a fact that there are a very few States which do not possess these raw materials in some quantity, and the time when they may become exhausted cannot be estimated.

The rapid progress of Portland cement as a constructive material has been unequalled, and its use has become so broad that in construction circles this is referred to as the "Cement Age." The great and increasing demand for Portland cement has been brought about by its ready adaptability to so many varied uses, and as these are continually being added to by new fields invaded, there is no reason to look for any halt or decrease in its manufacture. Moreover, the field is a constantly-widening one, and its success for one new purpose soon leads to an entrance into many kindred lines. This broad and diversified use of Portland cement is well shown by its adoption in all kinds of development work, which would hardly have been possible through the use of other materials except at great cost; indeed, some of them would not have been possible at all, as it is an acknowledged fact that many of the great engineering projects of today could not have been built without cement.

Reinforced concrete, in which form Portland cement is perhaps most largely used for general construction purposes, has enjoyed a remarkable growth, and the suc-



PENNSYLVANIA RAILROAD GRAIN BINS, BALTIMORE, MD.

been estimated that the various Southern State and municipal governments alone have planned or contracted for such work aggregating in value at least \$100,000,000 during 1908. This means activity in all lines of construction, involving a vast quantity of all kinds of materials and supplies. Of these materials, none is being consumed in such great volume as cement, and however much the demand for cement may fluctuate in other parts of the country, there is every reason, on account of the great amount of work going on now and coming up in the future, to look forward to a greatly-increasing demand for cement in the South for many years to come. In fact, it may be said that no other section of the country holds out to manufacturers of cement and other construction materials a field for future business equal to that of the South and Southwest.

It is a noteworthy feature that cement has reached the period of practical success at a time when the country is awakening to the necessity of conserving its natural resources, having been brought to a realization that if its timber lands, ore deposits and other raw materials are to continue at the present rapid rate of consumption, they will soon become exhausted. No other constructive material can approach cement in the great number of products for which it can be used as a substitute, so that its practical development may be looked upon as a blessing coming at the most opportune time. It is used as a substitute especially for steel and wood, and thus leaves these highly-important materials for purposes where no other product will suffice, thereby prolonging their period of supply. No one today has knowledge of the full amount of raw

cessful manner in which it has met many engineering problems has caused it to be accepted by the leading architects and engineers for most every class of work.

In building construction especially has the adoption of reinforced concrete been notable, this being due perhaps to the fact that more than any other material does it lend itself to securing of an ideal structure for all purposes. This same success has also been achieved in all other kinds of construction work, such as bridges, sewers, viaducts, etc. Another interesting field in which Portland cement has made rapid strides is that of dwelling-house construction. So far this has been mainly through the use of cement or concrete blocks, which have been found to give the best of satisfaction, and at a comparatively small cost. These blocks were somewhat crude at first, but they are continually being perfected, until today they are being used in the best kind of residence work. Concrete blocks commend themselves particularly to the Southern climate, because most of them are made with a hollow air space, which tends to keep the home cooler in the hot seasons. A recent interesting departure in dwelling-house work, particularly in the remodeling of old frame houses, is to supply the exterior with a cover of expanded metal and coat this with a cement mixture, thus giving the home a good, substantial outside covering, with a good architectural effect, at small cost.

From Maryland to Texas cases can be cited where Portland cement has been used that are at once unique and interesting, and which strongly evidence the broad knowledge and appreciation which the South must have of its value and adaptability. In

the great improvement work undertaken in Baltimore since the fire of 1904, including the reconstruction of the burned area, the building of complete sanitary and storm-water sewerage systems, the new system of docks and piers, new reservoirs and the paving of many streets, enormous quantities of cement have been used, and here can be found some of the most distinctive types of concrete construction of every kind. At both Newport News, Va., and Charleston, S. C., concrete drydocks have been built, the former by the Newport News Shipbuilding & Drydock Co. and the latter by the United States Government at its navy-yard.

Throughout the Piedmont section of the South, that great active industrial area, are found many structures for diversified purposes constructed of concrete, one of the

made arable. In fact, there does not seem to be any kind of construction work in which cement in some form cannot be used to an advantage.

For the purpose of giving the general reader some idea of how broadly cement is being used in the South and Southwest, the MANUFACTURERS' RECORD has gathered together from various sources a few illustrations of work in which this material was the dominant one. All of the work shown was started or completed during 1908. Although a year of retrenchment by many, the opportunity was taken advantage of by numerous far-seeing business men to erect additions and new plants and carry out other improvements when the cost of building materials and supplies were low and labor was plentiful. The great amount of such work going on in the South during the past year reflects the faith which its people must have in its great future development, and likewise their intention to be in a position to take the fullest advantage of returning prosperity.



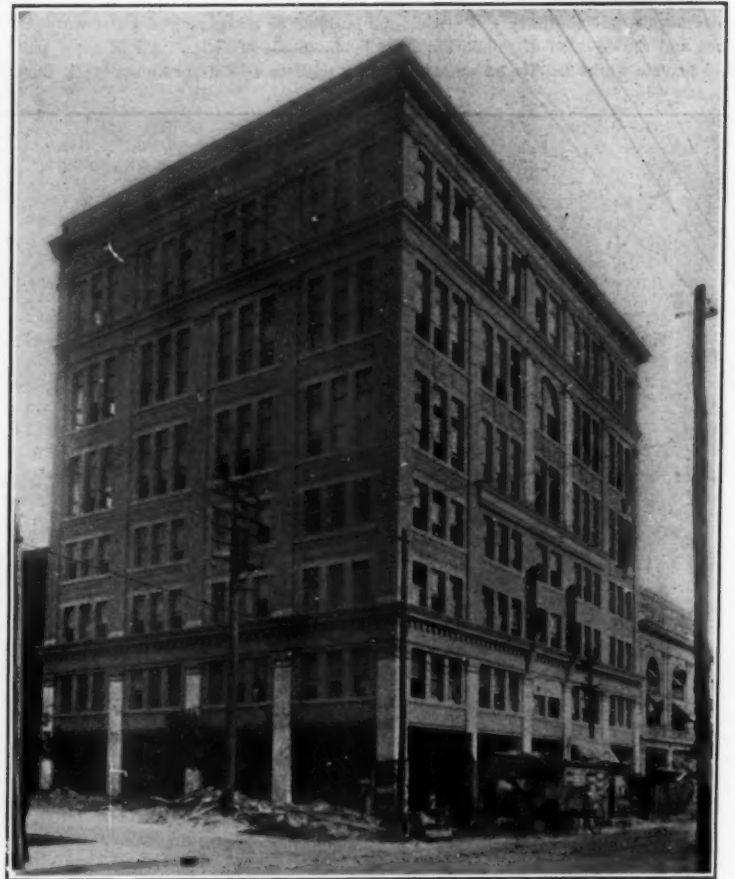
MASONIC TEMPLE, RALEIGH, N. C.

most notable of these being the plant of the Champion Fibre Co. at Canton, N. C., in which are 35 buildings, and every one constructed of reinforced concrete. In this same section are many water-power developments, most of which are largely constructed of Portland cement, likewise many other large engineering projects. The railroads of the South have been large users of this material in building viaducts, bridges, culverts, shops, roundhouses and lining tunnels. At many of the Southern seaports Portland cement has been a leading material in the construction of seawalls, warehouses, piers and for other purposes where stable and lasting qualities were desired. Many storage warehouses throughout the South are of concrete construction, and particularly is this



ARCH BRIDGE OVER FLAT CREEK, SOUTHERN RAILWAY.

becoming the favorite material for the storing of cotton, the South's leading agricultural crop, its use for this latter purpose being brought about by its fireproof and damp-proof qualities, it being realized that thousands of dollars would be saved annually by having such structures. Even now chains of these warehouses are being erected throughout the cotton-growing area. In the levee work along the Mississippi River cement has been found of the greatest practical value in keeping that mighty stream within its bounds. Portland cement has been a leading material in the great irrigation work of the Southwest, where thousands of arid lands have been reclaimed and



MASONIC TEMPLE, JACKSONVILLE, FLA.

One of the most important natural resources which the South possesses is that of numerous streams which can be utilized for water-power development. Each year finds additional projects carried to completion, and many of these would not be possible from an economical standpoint were it not for the ready adaptability of concrete for the construction work. One of the most notable water-power developments in the country, which is now rapidly nearing completion, is that of the McCall's Ferry Power Co. on the Susquehanna River, about on the northern boundary of Maryland. Here about 100,000 horse-power will be developed and distributed over a wide area, a large part of



REINFORCED CONCRETE SHEET PILING, BALTIMORE, MD.

it being used in Baltimore. One of the illustrations shows the big dam at one stage of construction, and gives a comprehensive idea of the enormity of the undertaking. In this work over 200,000 barrels of Giant Portland cement, made by the American Cement Co., Philadelphia, Pa., was used. Another interesting power development is that of the Rocky Creek dam of the Southern Power Co., which operates a number of water-powers in North Carolina. This dam was begun and completed during the past year, and in its construction there was used about 100,000 barrels of Edison Portland cement.

While only two of the water-power developments are cited, there are numerous

others recently completed or in some state of construction in various parts of the South and Southwest, and in practically every one of them cement has been the leading and most important material used.

The largest improvement undertaken by Baltimore after its great fire of 1904 was



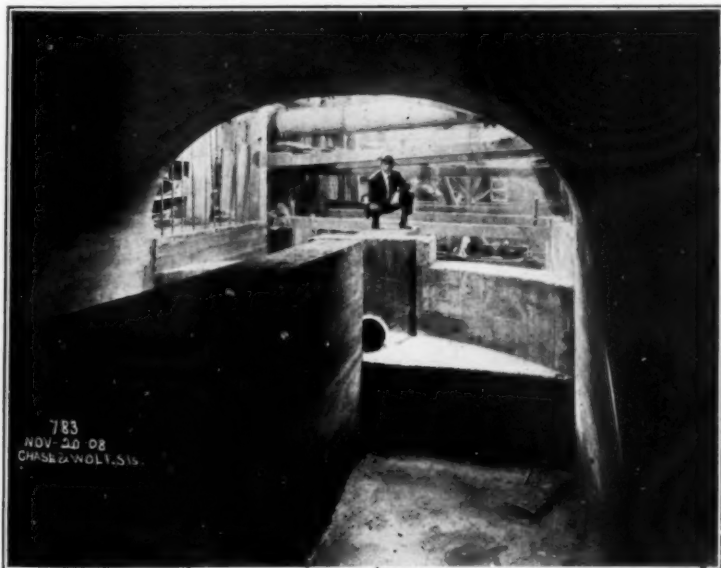
ATLANTIC COMPRESS CO.'S BUILDING.

the construction of complete sanitary and storm-water sewerage systems. Ten million dollars was voted by the people for this work, actual construction of which has now



REINFORCED CONCRETE PIER CONSTRUCTION, BALTIMORE, MD.

been under way a little more than two years. During that time more than \$5,500,000 worth of contracts have been awarded and about 50 miles of sewers of both kinds have



CONCRETE SIPHON, BALTIMORE'S SEWERAGE SYSTEM.

been constructed. All of the larger sewers, including the main outfall sewer, the high and low level interceptors and the force mains are constructed of solid concrete, half-lined with brick. Two of the illustrations, showing sections of the main outfall sewer, which is seven miles in length and about 12 feet in diameter, give a comprehensive idea

of the character of the construction. These are of solid concrete construction, 15 inches thick and reinforced with Ransome bars. Another illustration shows a view of a portion of a siphon constructed to allow the storm-water sewer to pass under the big main outfall sanitary sewer. This is one of the largest siphons in the country and is a



REINFORCED CONCRETE SANITARY SEWER, BALTIMORE, MD.

marked departure from the usual type of siphon construction, in that it is self-cleansing. A smaller one on similar lines has been in service nine months, and has thoroughly



CONCRETE REVETMENT ON MISSISSIPPI RIVER LEVEE.

demonstrated its self-cleansing features. In speaking of this particular piece of work, Chief Engineer Calvin W. Hendrick of the Sewerage Commission stated that its ideal



CONCRETE GRANDSTAND, JOHNS HOPKINS UNIVERSITY.

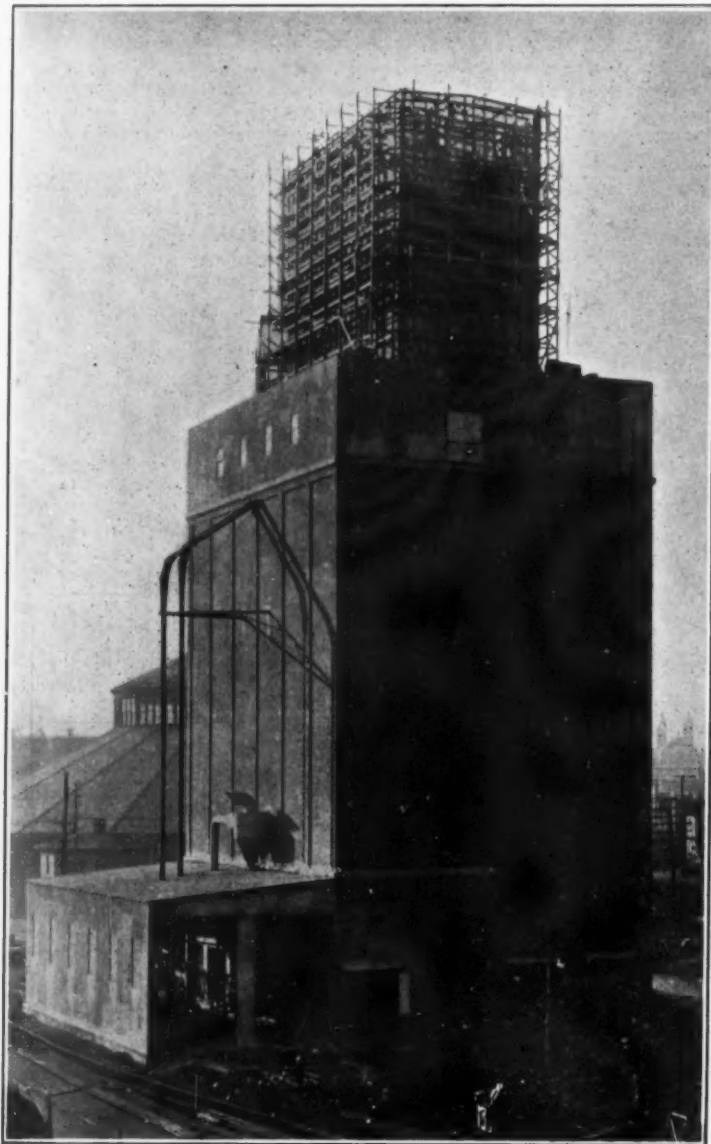
construction would not have been possible except through the use of concrete. This statement strongly evidences the important part which cement is playing in making possible many important engineering undertakings.

Pipe constructed of cement and reinforced with steel has proved a successful

substitute for the older materials used in sewerage and water-works systems, and its adoption for work of this character throughout the South has been noteworthy. In Baltimore, Md.; Columbia, S. C.; Atlanta, Ga.; Savannah, Ga.; Mobile, Ala.; Knoxville, Tenn., and a number of other Southern cities large quantities of this make of concrete

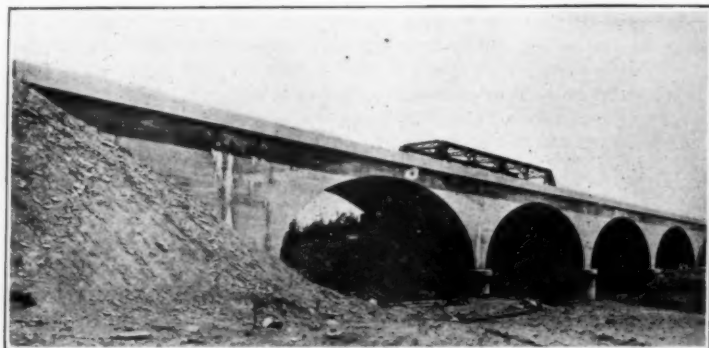
laid are connected with cement joints, so that when the whole line of pipe is completed it forms one continuous and solid concrete tube of great stability.

Perhaps one of the most notable undertakings from an engineering standpoint in which concrete has been substituted for other materials in the South has been in the



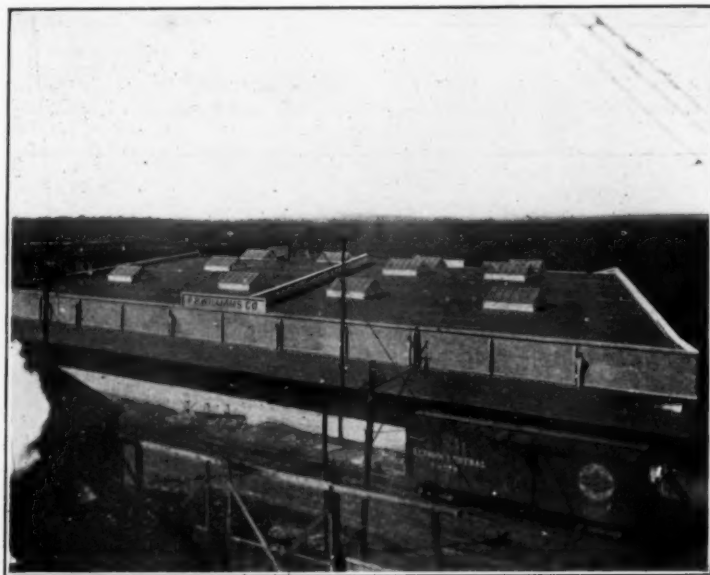
BALTIMORE & OHIO RAILROAD GRAIN ELEVATOR, BALTIMORE, MD.

pipe have been laid, and its use is rapidly spreading as it becomes more and wider known. An illustration herewith shows a section of large diameter of this pipe which is being laid in Baltimore, Md., where it was adopted for all of the large diameters in connection with a complete storm-water sewerage system that is being constructed.



VIADUCT OVER SWEETWATER CREEK, SOUTHERN RAILWAY.

construction of Baltimore's new dock system. In considering plans for the reconstruction of that portion of the water front destroyed in the fire of 1904 it was determined to build six piers of modern design. The first three were constructed of timber and stone, but for the last three, after a thorough investigation and study, it was decided to use reinforced concrete. This is a marked departure from the usual method



P. P. WILLIAMS' CONCRETE WAREHOUSE, VICKSBURG, MISS.

of pier construction, and the engineering profession is watching it with great interest. The contract for their erection was awarded to Sanford & Brooks Company, contractor, Baltimore, Md., at its bid of about \$1,225,000. Some idea of their size may be obtained from the following dimensions: Pier 4, 978 feet long and 200 feet wide; pier 5,

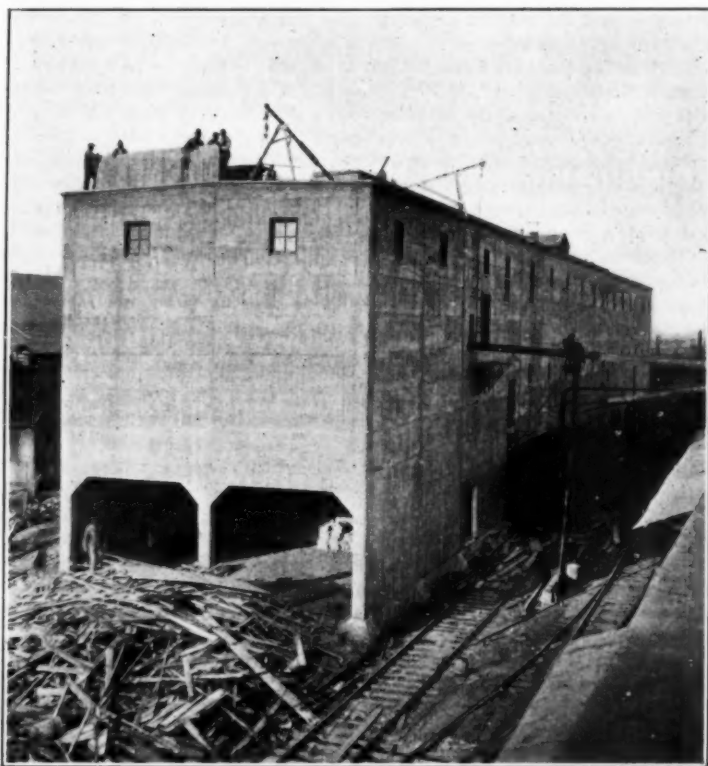


CUMMINS STATION WAREHOUSE, NASHVILLE, TENN.

In this work great quantities of this pipe are being used, it being made according to the system of the Reinforced Concrete Pipe Co., Jackson, Mich., and the numerous tests made of it by the Sewerage Commission have all been thoroughly satisfactory and have demonstrated the wisdom of its selection. Among the features which have contributed to the broad use of this pipe are that they are made right on the job, and when

1300 feet long and 200 feet wide, and pier 6, 1456 feet long and 140 feet wide. The method of construction will consist of having steel cylinders, 450 in number, filled with concrete and sunk at regular intervals at the edges of the piers to a foundation 27 feet below mean low water. Each of these cylinders filled with concrete will weigh 300,000 pounds. Between the cylinders will be driven reinforced concrete sheet piling,

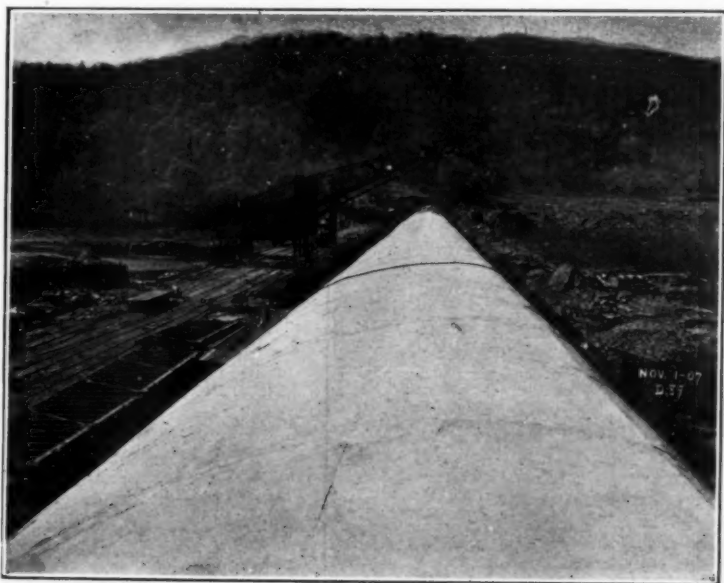
this being the first instance, so far as known, in which sheet piling constructed of reinforced concrete has ever been used. This piling will bear against steel lattice girders running horizontally on top of the cylinders and tied back to reinforced concrete piles driven at an angle of 30 degrees. All of the steel work will be encased in concrete, so that in the finished form the piers will represent a solid mass of concrete reinforced with steel. All of the concrete work, including the piles and sheet piling, was awarded by subcontract to the Raymond Concrete Pile Co. of New York city. Two illustra-



SOUTHERN COTTON OIL CO.'S WAREHOUSE, SAVANNAH, GA.

tions of this work are shown, one being a portion of a pier under construction and the other a quantity of sheet steel piling ready to be driven.

An interesting phase of engineering work in which concrete has been found of practical value is in drydock construction. Two such docks of recent construction are located, one at the United States Navy-yard at Charleston, S. C., and the other at the plant of the Newport News Shipbuilding & Dry-Dock Co., Newport News, Va. An illustration of the latter is shown. The fact that both the Government and one of the leading shipyards of the world should have decided upon the use of this material carries with it convincing evidence of the faith which they must have in cement for such work. Old Dominion Portland cement was used in both of these structures and was furnished by the William G. Hartranft Cement Co., Philadelphia, Pa. This same brand



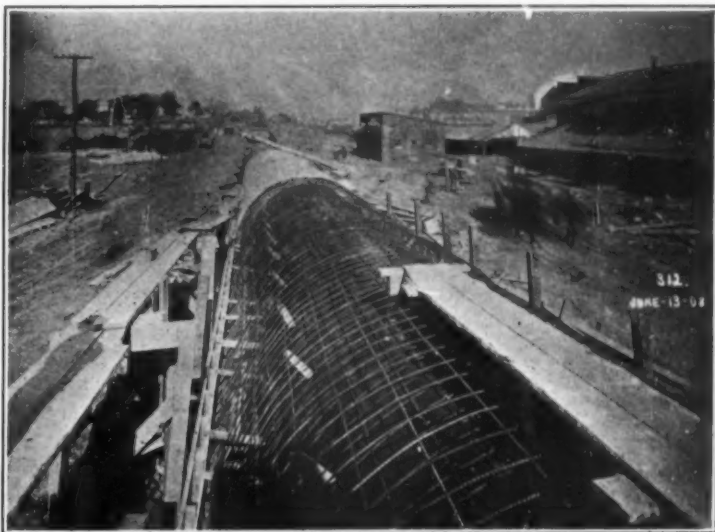
CONCRETE DAM, M'CALL'S FERRY POWER CO.

of cement was also largely used in the construction of numerous other buildings and shops at the Charleston Navy-yard.

A new departure in the method of protecting the Mississippi River levees from wave-wash damages, caused by large steamers and high winds, was inaugurated by Major J. F. McIndoe of the United States Engineering Corps. This consists in substituting concrete for the wooden revetments which had formerly been used. Concrete four inches thick and reinforced with Clinton wire fabric was placed from the top of the levee to the toe of the slope, and vertically two feet in the berme. Among the results noted from the use of this material are that it reduces seepage through the embankment to practically nothing; reduces the cost of cleaning and removing weeds and coarse

vegetables by almost half, and prevents the muskrat and crayfish from digging holes which so often heretofore have caused crevasses. Every indication points to the use of concrete for this purpose, it being efficient as well as economical. An illustration of a portion of the levee when this work was in progress is shown.

A significant feature of the increase of their grain storage facilities by the Pennsylvania and Baltimore & Ohio Railroads at Baltimore was the use of reinforced concrete for the structures. For auxiliary storage purposes at its export elevator at Canton the Pennsylvania Railroad has constructed a series of grain bins having a capacity of 1,023,600 bushels. On account of these being used for storage purposes, it was determined to build them of concrete, thus protecting the contents against fire, dust, dampness, rats and vermin. When the Baltimore & Ohio Railroad's local grain-distributing elevator was destroyed by fire it was decided, upon rebuilding, to make the structure fireproof, and concrete was selected owing to its peculiar adaptability to this class of construction. Both of these structures represent the highest type of construction work and are in themselves monuments to cement. Both were constructed by James Stewart & Co., Chicago, Ill., and in both of them Giant Portland cement, made



REINFORCED CONCRETE SANITARY SEWER, BALTIMORE, MD.

by the American Cement Co., and reinforcing bars, made by the Carnegie Steel Co., Pittsburg, Pa., were used. The accompanying views of the two structures impress one with the splendid manner in which this material has lent itself to this class of construction.

At several of the large colleges in the North the stadiums where the athletic games are held have been constructed entirely of reinforced concrete and have given the best of satisfaction. The first work along this line in the South to be noted was the grandstand at the athletic field of the Johns Hopkins University, in Baltimore. As will be seen from the accompanying illustration, the structure is strong and stable, without being cumbersome, and at the same time has a beautiful architectural appearance. It was designed by Parker, Thomas & Rice, architects, Baltimore, and constructed ac-



CONCRETE PORTAL TO LOOKOUT MOUNTAIN TUNNEL, SOUTHERN RAILWAY.

cording to the system of the Trussed Concrete Steel Co., Detroit, Mich., Kahn bars being used in all structural portions and Hy-Rib metal in the hand rails.

The use of reinforced concrete for the more ornate building structures in cities throughout the South is always on the increase. In most cases the concrete is used for structural purposes only, the exterior, or curtain walls, being built of other materials. Two of these buildings are shown, both being Masonic temples—one in Jacksonville, Fla., and the other in Raleigh, N. C. The former structure was erected according to the system of the Southern Ferro-Concrete Co., Atlanta, Ga., and the latter of the Corrugated Bar Co., St. Louis, Mo.

Business men of the South have learned so much from actual experience of the ad-

vantages and value of concrete warehouses, particularly on account of the protection given against fire, rats, dampness, etc., that they are erecting more and more of them every year. These warehouses are operated somewhat along the line of the beehive manufacturing plants, and consist of large fireproof structures in which space is taken by a number of different firms engaged in similar or kindred businesses. A striking case in point is the Cummins Station warehouse, erected by the Merchants' Wholesale Warehouse Co., in Nashville, Tenn. An accompanying illustration shows this im-



CONCRETE PIPE, BALTIMORE'S SEWERAGE SYSTEM.

mense structure, which is 130x500 feet and four stories in height, with basement and sub-basement. It is constructed of reinforced concrete, according to the system of the Corrugated Bar Co., St. Louis, Mo., and it is one of the largest monolithic concrete warehouses erected under one roof in the country. So successful has this venture been that the company is now arranging for the erection of an addition 380x130 feet. This addition will also be constructed of reinforced concrete, the company feeling that this

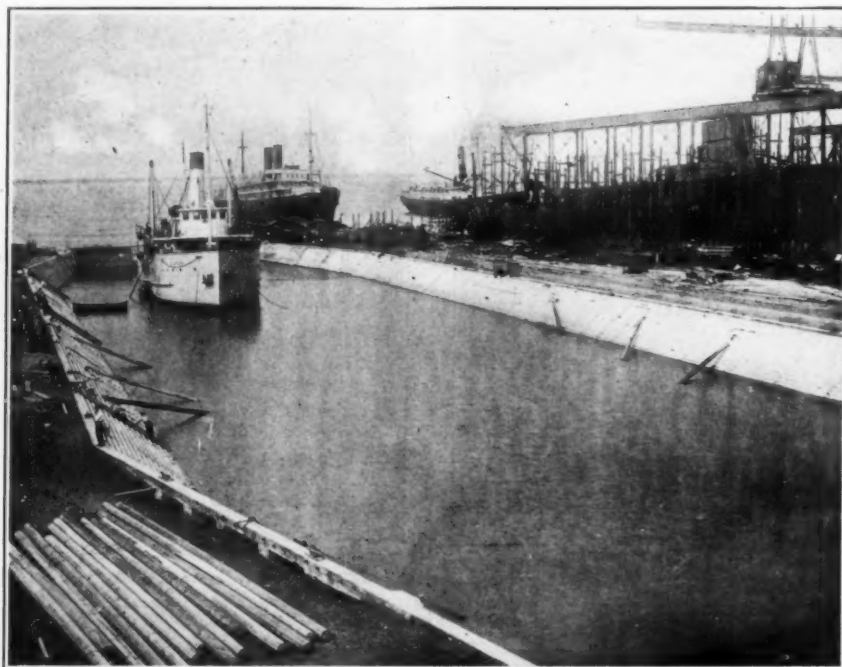
struction are shown in the illustrations of the buildings of the P. P. Williams Company of Vicksburg, Miss., and the Atlantic Compress Co. The former, which is 225x275 feet, is used for a general wholesale grocery and provision business, and the latter for storing cotton. Both of these structures were erected according to the system of the Corrugated Bar Co., St. Louis, Mo.

In planning the buildings of its new plant the Acme Match Co. of Roanoke, Va., recently organized to manufacture matches, determined that they should be of fireproof construction. Reinforced concrete was selected as the material best suited for their purpose, and the contract for construction was awarded to C. W. Hancock & Sons of Roanoke. Five buildings in all are to be erected. The Johnson system of reinforcement of the Corrugated Bar Co., St. Louis, Mo., is being used for all girders, columns, pilasters and beams, and for all floor and roof slabs and other work the triangular wire-mesh system of the American Steel & Wire Co., New York, is being used. This is an excellent example of how peculiarly this material lends itself to the construction of buildings of a plant devoted to the manufacture of inflammable products. Another interesting structure, an illustration of which is given, is that of the new reinforced concrete building erected by the Southern Cotton Oil Co. at its Savannah plant. This structure not only serves for warehouse purposes, but it is also designed to act as a fire barrier between two large wooden buildings. The triangular wire mesh of the American Steel & Wire Co. was also used in this building for all floor and roof slabs.

Southern railroads have been quick to recognize the value of concrete for general construction purposes. In new work it is being most largely used, and is also being substituted for older work as this needs replacing. In roadbed work concrete is now being adopted for the construction of bridges, viaducts, culverts, retaining walls, lining tunnels, etc., and in terminals, stations and shops for building work generally. In the general improvement work undertaken by the Norfolk & Western Railway during the last year or so concrete was used for various purposes. For the lining of tunnels it was very extensively employed, among them being several west of Welch, W. Va., in which the Ironport Portland Cement Co.'s product was used. In the construction of the new Carolina, Clinchfield & Ohio Valley Railway from Elkhorn, Ky., to Spartanburg, S. C., concrete was adopted for all foundation work, and piers for bridges and viaducts, for culverts and for lining tunnels. The construction of the famous reinforced concrete bridge by the Florida East Coast Railway to Key West, one of the engineering feats of the day, would hardly have been possible with the use of any other material but cement.

The Southern Railway, in bettering its lines in various parts of the South, adopted concrete wherever feasible. Three illustrations of this work are shown, one being the portal of the Lookout Mountain tunnel, just outside of Chattanooga, Tenn.; another a double 50-foot arch bridge over Flat Creek; on the double-tracking work from Knoxville to New Line, Tenn., and the third a concrete viaduct over Sweetwater Creek, on the double-track work between Austell and Peyton, Ga. These few illustrations indicate the broad and especial adaptability of this material for modern railroad construction.

The South contains the raw materials in abundance necessary for the manufacture of Portland cement, and at many points these exist in such close proximity to each other that the most economical manufacture is possible. While the South today has only a small percentage of the country's total output, each year finds some new plants put into operation, and the tendency is always on the increase. Noteworthy among those starting operations during 1908 are the Dixie Portland Cement Co., at Richard City, Tenn., and the Maryland Portland Cement Co., at Security, Md. The plant of the Dixie Company is the largest in the South, it having a daily capacity of 6000 barrels of its Royal brand. An especially notable feature of this plant is the fact that in the construction of the various buildings cement was a leading material, so that it is typical of the industry which it represents. All of the structures have heavy reinforced concrete foundations, and a number of them reinforced concrete walls and floors, while others have steel frames fireproofed with expanded metal and concrete.



CONCRETE DRYDOCK, NEWPORT NEWS, VA.

material has well proved its splendid adaptability for the purposes for which it is used and for the protection it gives from fire, rats, vermin, etc., as well as giving the occupants the lowest possible insurance rates. Those located in this warehouse are wholesale grocers, and it is essential that their stocks should be protected against damage from causes referred to.

Two other interesting examples of the use of reinforced concrete for warehouse con-

indicative of the quality of its output is the fact that it has been used in all parts of the South for all purposes, the most important of which, by reason of rigid requirements, being a number of United States postoffice buildings erected in North and South Carolina, Georgia and Alabama.

The significant feature of the Maryland Portland Cement Co.'s plant is that it is the first high-grade Portland cement plant to be established in Maryland. It has a

daily capacity of 800 barrels. The various buildings comprising the plant are well constructed of steel and corrugated iron, and are laid out so as to insure economical manufacture and a progressive movement of raw materials to finished product. It has the advantage of excellent railroad facilities, which enables it to get quickly into a large consuming area. In both of these plants the machinery and equipment is of the very best, and every advantage has been taken of the improvements in the industry, so that they may be said to represent the modern Portland cement plant of the day.

While these illustrations are necessarily confined to a few random examples of the present diversified use of concrete in the South and Southwest, they serve to indicate how this material is continually finding favor with the leading architects and engineers of the day and to point out its vast possibilities in the future. They also indicate that great quantities of cement will be used in construction work of all kinds following the broader and increasing development of those sections.

REINFORCED CONCRETE FOR BUILDINGS.

An Interesting View of a Subject Becoming More and More Important.

By H. C. TURNER, C.E.

[Written for the Manufacturers' Record.]

With building materials at bedrock price levels and labor plentiful and efficient, the opportunity for the erection of buildings, at costs lower than at any time in the past five years and probably lower than they will be in the next five years, should be taken advantage of by all who contemplate construction work in the near future.

Large corporations like the Standard Oil Co. and the American Tobacco Co. were very quick to take advantage during the past year of these conditions. The Standard Oil Co. has erected during 1908 one of the largest refineries in this country at Bayway, N. J., and by their foresight have undoubtedly saved a considerable percentage on the normal cost of such work and at the same time giving employment to large numbers of workmen during a period when men were urgently seeking work. Frederick Loeser & Co., who have one of the largest department stores in Brooklyn, N. Y., after mature consideration of all the conditions entering into building construction, decided to build a 10-story warehouse this year, and thereby benefit by the material and labor markets. The saving to be effected by such a course is easily understood when attention is called to the fact that cement can be bought for 85 cents a barrel at the mill, steel bars for \$1.40 per 100 pounds f. o. b. Pittsburg, lumber at lower prices than have existed in years, and so on through the entire list of building materials.

If proper consideration is given to these indisputable facts, property and industrial interests will go ahead with their proposed building operations at once. Confidence in the business future is rapidly spreading to all sections of the country, and mills and factories are resuming full time. Long-delayed orders will soon tax their facilities and render additions to plants necessary. Real estate and building interests look forward to a very active year in 1909.

Before letting contracts owners and their architects would do well to study carefully the different building materials on the market. Among them of particular interest is reinforced concrete. Although a comparatively new material in this country, reinforced concrete has been extensively used in France and Germany; in fact, it is one of the oldest building materials, as exemplified in the old Spanish and Roman aqueducts. Its very rapid development during the past 10 years in this country has been due to the thorough investigations made by the architects and engineers of the country. In the South it is notable that Mr. J. G. Christopher of Jacksonville, Fla., has built during the past year three large loft and warehouse buildings entirely of reinforced concrete, although right in the heart of the yellow-pine district, the costs of these buildings not exceeding the estimates for mill con-

struction by more than 12 per cent. This additional cost would be more than offset by the saving in maintenance and insurance.

The prospective builder, after considering the comparative costs of the different methods and materials of construction, should carefully weigh the other advantages possessed by the material with which he is going to build. Several very large concrete factories and warehouses in Brooklyn and New York city obtain flat insurance rates of from 7 to 12 cents. On a large color works in Staten Island, New York, the rate on buildings and contents combined is 10 cents. There are instances through the Middle West where large reinforced concrete buildings have been offered rates as low as 6 cents. Such fires as those which have occurred in the Dayton Motor Car Works at Dayton, Ohio; in the Pacific Coast Borax Co.'s plant at Bayonne, N. J., and the Thompson & Norris Company's factory, Brooklyn, N. Y., establish beyond dispute the ability of reinforced concrete construction to go through the severest fire without serious damage. The conflagrations in San Francisco and Baltimore show satisfactorily the manner in which concrete buildings stood up against the terrific heat maintained there for long periods of time. With the constantly-increasing realization on the part of the general public of this country's terrific annual fire loss, amounting to \$180,000,000, the demand for fire-proof construction has become greater year by year.

In addition to its fireproof properties, this material is waterproof and vermin-proof. Very frequently the damage of small fires is largely due to water running from floor to floor and seriously injuring stock. With concrete construction this is impossible. Vermin to many concerns are responsible for losses of some magnitude. It is easily appreciated that in concrete structures there is no place for mice, rats, bugs, etc., to hide. The question of vibration in many factories and mills is of prime importance. There are numerous cases on record where machinery has to be operated at reduced speeds in order to do away with vibration of such a serious nature as to endanger the life of the building. There are also citable cases where in reinforced concrete buildings the very heaviest machinery is operated at high speed with an absence of vibration so complete that coins may be stood up on edge on the bedplates of the machines without difficulty. This item of vibration has direct bearing on the amount of power necessary to operate machinery, and as well on the amount of repairs to machinery. One prominent paper manufacturer of Brooklyn is the authority for the statement that his concrete buildings save him \$5000 a year in machinery repairs, and about 20

per cent. in the amount of power necessary to operate his plant as compared to the normal conditions in his mill-constructed buildings.

The amount of light obtainable with concrete construction, owing to its skeleton method of erection, is maximum. The numerous and large windows in the Robert Gair Company's Building, Brooklyn, N. Y., has been commented upon as one of the striking features in connection with this building. The increased light influences the effectiveness of the employees' work as well as the state of their contentment. Closely associated with this property of an ideal building material are the sanitary features. Cement being a lime product, and, as before noted, being waterproof and vermin-proof, cannot be excelled along these lines.

In looking over the general situation, therefore, it would seem reasonable to advise the prospective owner or builder to get his contracts for new buildings or new

sanitary conditions. Each case is separate unto itself, but the industrial executive will probably be able to calculate the financial value of these different properties to his business.

CLOSING LEVEE BREAKS.

New Use Suggested for Steel Sheet Piling.

[Special Cor. Manufacturers' Record.]
New Orleans, La., December 26.

Steel sheet piling for the effective closing of a crevasse or break in a river levee in the quickest time and at the lowest cost is an almost startling suggestion made by a local engineer for an additional use to which this comparatively new but already widely utilized material may be put. The claim is made by those familiar with the cost and the ease with which the steel sheet piling can be driven that such a crevasse as occurred at Point Beka, on the Mississippi River, 15 miles below New Orleans, last June, might have been closed



SECTION OF ST. PHILIP SEAWALL.

construction work signed at once, so that he may reap the benefit of the present low prices of materials. Furthermore, it is proper to advise him to carefully look into the different materials and methods of construction which are on the market, and in so doing to be guided not only by the first cost, but as well by the properties of the different materials along the lines of fireproofness, waterproofness and general serviceableness, and finally to take into account the ultimate cost of his proposed structure. In arriving at this he will have to take into consideration the interest charges on the initial cost of his building, the insurance rates, the maintenance and depreciation charges, as well as the influence of the following items: Vermin, light, waterproofness, vibration, and the

within 48 hours, and at a cost of only a few thousand dollars, had sheet piling been used instead of the old-time system of cribbing and sacking which was employed. The break in the levee occurred about 7 o'clock A. M. Saturday, June 6. By about 2 o'clock that afternoon the break had developed to a width of 30 feet. Efforts undertaken that day to close the crevasse were continued till the 9th, when they were abandoned as a failure. Two days were then devoted to planning a more effective way of closing the crevasse, and finally on the 12th a large working force had been gathered, an organization effected and the final work begun, and by Sunday morning, the 21st, 15 days after the break occurred, and by which time the crevasse had attained a width of 100 feet, the flow through

the crevasse was checked. The construction of mud boxes around the cribbing, with further sacking and the trimming up of the cribs to provide for shrinkage and settling came next, so that it was Thursday, June 25, before the work was completed in its entirety.

In carrying out this work an army of laborers and an elaborate commissary and housing system for the men had to be provided. There was a general superintendent

of closing a crevasse, if only one-tenth the claims of the sheet-piling advocates should be substantiated. It is not to be assumed that the levee board was lacking in ability, energy or enterprise, or that the engineers are to be charged with a failure to meet the situation. Indeed, compared with some previous feats of levee closing, the work done here was notably expeditious and the damage insignificant. Everything was done in accordance with the best ac-

cepted practice, and by that standard it was faithfully, energetically and creditably accomplished. How much of a discovery the piling method is and how revolutionary is thus all the more tremendously emphasized.

30 to 60 or even 90 feet. In most cases 30 feet would be sufficient. It interlocks, so as to present a practically water-tight surface from the time it is driven. To completely prevent the ingress of water, wooden packing strips may be driven in the interlock at the same time the piling is driven. The swelling of these wooden strips effectually fills the packing spaces. If driven deep enough, steel sheet piling requires no bracing. If local conditions suggest its desirability, however, the piling might be filled in behind the piling, and as soon as the water receded the piling could be pulled and saved for another occasion. I have seen some of it used on 10 consecutive jobs, and it was in good condition when pulled for the tenth time."

The first extensive acquaintance had with steel sheet piling locally was in the case of the Fort St. Philip seawall. This old fort, dating back to 1793, and historically interesting for the defense it made against Admiral Farragut's advance on New Orleans in 1862, is 76 miles below New Orleans, and with Fort Jackson constitutes the outer defense of New Orleans. While 47 miles from the jetties at the mouth of the river, it is only about one mile from Breton Sound, an arm of the Gulf of Mexico. On the front the river levee gives ample protection against high

began. The length of the seawall is 4400 feet. The contract involved the enlargement of 3670 feet of old levee, the building of 730 feet of new levee, the driving of 4400 linear feet of steel piling and the placing of the reinforced concrete. The steel piles were 19 feet long, driven 14 feet into the levee and extending five feet above its top. Twelve-inch 35-pound United States steel sheet piling was selected, and 4476 pieces were driven, weighing in all 1508 net tons. A 2800-pound drop hammer was used in driving the piles, and but one piledriver was required. Remarkable speed records were shown in the work. In one hour 35 of the piles were driven; the minimum day's work of eight hours was 113, and the maximum, the high record for such work, was 281, or 281 running feet of water-tight wall.

The five feet of piling above ground was capped with concrete, made in blocks 10 feet long. Reinforcement was of plain round steel bars, clamped together. The cement used was furnished by the Universal Portland Cement Co. The concrete was composed of one part cement, three parts sand and five parts gravel. The concrete forms were finished to give a perfectly smooth surface, so that no outside covering was required after removal of the forms.

ALBERT PHENIS.



SHOWING CONSTRUCTION OF ST. PHILIP SEAWALL.

ent of labor and supplies, with a full force of foremen, stewards, cooks, waiters, scullions, etc.; there were a chief engineer, two assistant engineers, four superintendents of sacks, four superintendents of lumber orders, four bridge foremen, with full complement of men for crew for each, and there was a daily average of about 500 laborers. Materials required were 215,000 feet of lumber, 95,000 sacks with twine and needles, 50 kegs of wire nails, 50 bales of rice straw, four coils of manila rope, four large tarpaulins, wheelbarrows, spades, mauls, axes, hatchets, adzes, band and cross-cut saws, trucks, lamps, lanterns, etc., "all galore." Two large harbor tugboats were required, and four large model deck barges, two large covered barges, 20 small barges or scows, 10 skiffs and four large model quarter boats. The total money spent in the work of closing the Beka crevasse is understood to have been between \$60,000 and \$75,000, and the damage to crops and property by the overflow was doubtless \$50,000.

This history of the Beka crevasse closing, contained in a paper read by the engineer in charge at a meeting of the Louisiana Engineering Society, is given thus in detail to illustrate what an enormous advantage it would be in every way to substitute steel sheet piling for the old way

of closing a crevasse, if only one-tenth the claims of the sheet-piling advocates should be substantiated. It is not to be assumed that the levee board was lacking in ability, energy or enterprise, or that the engineers are to be charged with a failure to meet the situation. Indeed, compared with some previous feats of levee closing, the work done here was notably expeditious and the damage insignificant. Everything was done in accordance with the best ac-

cepted practice, and by that standard it was faithfully, energetically and creditably accomplished. How much of a discovery the piling method is and how revolutionary is thus all the more tremendously emphasized.

In discussing the matter an engineer who has had opportunities for observation says: "I believe there is a great field for sheet steel piling in the closing of a crevasse. In the case of a crevasse, if there is a piledriver and material at a given central point, the work of closing could be done within a few hours, and in any event by prompt action it would be an easy matter to do the work in a day or two, for anyone could drive the steel sheet piling faster than the river would widen the crevasse. It would probably pay the levee board to have on hand a piledriver and a supply of steel sheet piling for immediate use in emergencies. With a crew of eight men any capable superintendent might have undertaken to close such a crevasse with steel sheet piling within a day and a half at the outside, at a cost of some \$5000. However, if conditions had been the most unfavorable possible, and it had cost five times that amount, there would yet have been a tremendous saving in the cost of the work and in the crops destroyed. The piling is made in any required length, from



BIRD'S-EYE VIEW OF ST. PHILIP SEAWALL.

water, but on the rear, or Gulf side, the necessity for a better protection against storm tides than the earth levees provided has long been recognized. A seawall of masonry would be very costly at this point, as foundations would have to be placed at great depth, so when the War Department finally decided to convert the old earth levee into a seawall it was decided to use interlocking steel sheet piling, the top to be capped by concrete. The contract for the entire seawall was awarded by Col. E. H. Ruffner, Corps of Engineers, to Richard M. Murphy of New Orleans. The steel piling was furnished by the Carnegie Steel Co., Pittsburg. The work was done in remarkably short order, the job being finally accepted by the Government August 1, eight months after the first work

New Orleans Municipal Repair Plant.

The second annual report of operations of the municipal repair plant of New Orleans for the year ended August 31 has been submitted by City Engineer W. J. Hardee. Briefly summarized, the work of the plant included repairs of asphalt pavements at a cost of \$27,545.59; new asphalt pavements, \$14,409.33; other new pavements, \$23,445.81, and miscellaneous improvements, \$74,398.91. The general usefulness and economy of the plant are emphasized by the fact that of the total of \$139,799.67 expended for materials, labor and other charges, only \$77,545.59, or about 20 per cent, was for the repair of asphalt pavements, for which purpose the plant was primarily established.

TEXAN CITRUS FRUITS.**Culture Under Way and Planned in Houston's Vicinity.**

[Special Cor. Manufacturers' Record.]

Houston, Texas, January 2.

The really marvelous developments now going on in Texas, not only in the way of town expansion, but in fruit and truck-growing as well, find a very fair illustration in the achievements of a company in developing South Houston. Fifty houses built, two factories in operation and 3500 lots sold, at an aggregate of some \$685,000, is the record for the trifle more than a year that the Western Land Corporation has been in operation. The president of this corporation is Mr. C. S. Woods, a hustling young man who came here from North Carolina and at once became impressed with the future of Houston. The company he organized made a purchase of 4000 acres of land, touching on the Galveston, Houston & Henderson Railroad, about eight miles south of Houston. A thousand acres were cut up into lots, and a campaign of extensive advertising was begun. Through the MANUFACTURERS' RECORD Mr. Woods got in touch with a number of industries looking for a new location, and of the number negotiations were closed with three—a gas-engine works of Detroit, a stove works of Knoxville and a foundry of Iowa. The gas-engine works and the stove works, the first in Texas, are already in operation, turning out excellent products on a profitable basis, and with orders ahead for several months to the limit of their capacity, and the foundry is expected to be in operation soon. Free sites and other assistance have been given in these instances, and also in case of a girls' school, public schools, churches and a hotel, the latter completed. One wing of the girls' school, of reinforced concrete, is well under way, as are the two free schools and a number of the churches. Cement sidewalks and shell roads are being put down, and it is proposed to have sewers, water-works, electric lights and an interurban electric car line. Also plans are being formed to construct a spur track about eight miles long, which will tap three lines of railway and the ship channel as well.

In addition to the town development, work is proceeding on a plan to settle the remaining 3000 acres of the tract with fruit and truck farmers, and it is proposed to sell 5 and 10-acre tracts, planted in orange and fig trees, and under an agreement to take care of them until they become income-producing propositions. There is a remarkable development of the Satsuma orange industry in the country south of Houston now, amounting almost to a craze, based on the early and profitable yield of that variety of oranges in this climate. The trees bear at three years of age and yield a net profit of \$200 to \$500 an acre, or even more, and on the showing that has been made there are thousands of trees being planted right now in the South Houston territory.

Fig culture is another industry the coast country is engaging in extensively. A number of canneries have been established, which enter into three to five-year contracts with the producers on terms which make possible a profit of \$150 an acre, minimum, per annum. Strawberries also prove an attractive crop in this section, as they ripen in December and continue to yield for several months thereafter. Even depending on the Houston market alone, there are records of strawberry growers clearing an average of \$400 an acre per annum for the five years past, and with the development of the industry and the perfection of arrangements for marketing in the North, the profits are expected to be even greater and the demand practically unlimited, on account of

the early maturing of the crop in this vicinity.

With the development of the section it is regarded as certain that the introduction of other fruits will be found profitable, so that the expectation is entertained that not only this tract, but every other eligible location in the South Houston country, will shortly be thickly settled with prosperous growers of many kinds of fruits and garden truck, and that not even California will outrank this section in these lines.

ALBERT PHENIS.

VELASCO POSSIBILITIES.**Connected With Development of Texas Coast Country.**

[Special Cor. Manufacturers' Record.]

Velasco, Texas, Dec. 26.

There have been two Velascos; there may be a third. The original Velasco, named for a Mexican general, was located on the east side of the mouth of the Brazos River, along the shore of the Gulf of Mexico, and was never more than a fishing village. Quintana, on the west bank of the river, was for a time a summer resort of local note, but has at present not over 100 population.

The Brazos River is the largest stream in Texas, and, rising in the Staked Plains, it follows a southeasterly course and flows directly into the Gulf of Mexico, intersecting the Gulf shore at a right angle and having no delta. The stream carries considerable silt, but the currents in the Gulf wash this away into deep water, thus rendering the maintenance of a deep channel from the Gulf into the river a comparatively easy task.

Velasco is about 50 miles west-southwest from the port of Galveston, and its relative geographical location is comparable to that of the latter port, and the topographical features would seem to favor Velasco, as it is upon the main line, while Galveston is located upon an island. On the land side of Velasco the grades are so slight that railroads are built on less than one-half of 1 per cent. grade for fully 100 miles in every direction, and low grades can be maintained directly north to any point desired in this country or Canada. Upon the ocean the distances to Panama, Cuba, Mexico and South America compare favorably with those from any other Southern port.

The banks of the Brazos River are of silt and clay. There are no rocks or reefs. Navigation of the stream itself by small craft is not fraught with any danger. Tide-water extends for 50 miles inland, and, consequently, the current in the river in its lower reaches is not swift. The banks for over five miles above the mouth of the river do not attain a height of over 10 feet above mean low tide. The river varies in width from about 500 to 600 feet. At a point about one mile and a quarter in shore there is a great bend in the river from southwest to southeast, and a half mile farther up stream begins a reverse bend, which continues for two miles, describing in all nearly three-quarters of a circle. Above this again is a third bend, from northwest to west, in which the radius is of only a few hundred feet. Above this bend the river straightens out into easy curves as far as the present town of Velasco, two miles farther up the stream.

At this present town site of Velasco an effort was made to create a port in about 1890. A company was formed, which purchased nearly 30,000 acres of land, laid out a large town site, graded streets, built hotels at the town, and also on the beach at old Velasco, which they renamed Surfside. Gins, cotton-oil mills, electric-light and gas plants, banks and many stores and residences were erected, and a railroad was built to a connection with the Columbia branch of the International & Great Northern Railroad at Anchor, 20 miles dis-

tant inland. The town at one time had a population estimated at 5000, and many steamships came to the wharves, some of them drawing over 15 feet of water.

The panic of 1893 forced the controlling company into insolvency, and the inhabitants of the port rapidly scattered. The large hotels were destroyed at the time of the Galveston storm, in 1900, at which time most of the buildings in Velasco were destroyed or badly damaged. The Surfside Hotel, which was repaired after the storm, burned in 1907. The immigration to this section ceased, the wharves became wrecks and the financial stringency of 1907 and 1908 found Velasco at its lowest ebb.

Just at the beginning of the financial stringency in 1907 the coast country of South Texas had begun to attract attention in the Northern and Central States on account of the financial success of scattering farmers who had prospected with fruits, vegetables and corn and sugar-cane crops, and the country was advertised by several prospective real estate firms who came into the country. Even during the worst of the panic many prospectors came into this region, and since better times have obtained many actual settlers have begun to open up farms in the coast country around Velasco.

The tide of immigration having set toward this country, it now seems probable that the coastal plain of Texas will become densely populated. Several young men became attracted by the latent possibilities at Velasco and began work upon the problems which confronted them in the proper, conservative and permanent development of this port, among these men being Felix Jackson, vice-president and general manager of the Houston & Brazos Valley Railroad Co.; J. Harvey Hill, cashier of the Velasco State Bank; C. J. Horn of the Brazos Coast Investment Co.; W. T. Hall of the Central Coal & Cement Co.; Mr. Hollingsworth, Capt. Sam Higgins and others have taken an active part in the work; various companies have secured the holdings of the old "Boston Syndicate," and any enterprise desiring industrial or shipping facilities can secure them upon the banks of the Brazos River.

In former years such engineers of note as Louis Giraud, Wisner and Cauthell were employed in building the railroad and locating the town, the wharves and other improvements. At present a man named John C. Tolman, who a few years ago was an axman in a surveying party, is in charge of the engineering work. Mr. Felix Jackson has had Mr. Tolman build an extension of the Houston & Brazos Valley Railroad from the town of Velasco to a point on the bank of the Brazos River below the three great bends previously mentioned and on from 21½ to 25 feet of water in the river. Here are intended to be located, and at this time are under construction, wharves and warehouses for the Velasco Wharf & Terminal Co., of which Mr. Jackson is manager; coalbins and yards for the Central Coal & Cement Co., of which Mr. Hall is manager, and various developments for the Houston & Brazos Valley Railroad Co. From the downstream end of this work a clear channel 25 feet in depth extends to the outer end of the jetties, which extend a mile into the Gulf. There is a small bar at the Gulf end of the jetties, upon which a depth of 16 feet at low tide is available under present conditions. The employment of one dredge would render a depth of 25 feet easily possible of maintenance at this point. By employing a Hopper dredge the excavated material could be used in raising the grade of the low lands on either side of the river.

Homeseekers from Michigan have been inspecting lands near Brunswick, in Glynn county, Georgia.

OPULENT IN RESOURCES.**Section of Tennessee Recently Opened Up by a Railroad.**

Editor Manufacturers' Record:

No Southern man can read the recent issues of your paper and not be an optimist. This section of the South is rapidly recovering from the financial panic of October, 1907, which struck all of our industries with much force. We note in your issue of the 24th that practically the only extensions made by the Southern Railway Co. of its lines during the present year is the construction of 25 miles from Maryville, Tenn., to Chilhowee, on the Little Tennessee River. This is one of the most important lines of the Southern's great system. This is evidenced by the fact that the road was only partly graded at the time of the panic, but industries had started up along the line which promised tonnage in paying quantities, and notwithstanding the force of the panic, the Southern Railway Co. continued its construction work on this line, completed it and put it in operation in November.

The line extends into the hardwood section of the Chilhowee and Unaka mountains. A number of sawmills were located on this line of road before it was completed, and are now shipping out their product to market. The timbers consist of poplar, oak, chestnut, yellow pine and hemlock of the finest quality and the highest grades. The forests were all virgin two years ago, and many tracts now accessible to the railroad are still in the hands of the original owners, who are not operating the timber thereon.

There are fine deposits of iron ore along this road, and much of this has recently been purchased by the Lafollette Coal, Iron & Railway Co., that has its furnaces at Lafollette, in Campbell county, Tennessee. The iron ore is of the highest grade, equaling that which is found at Ducktown, Tenn., and at Cranberry, N. C.

Probably the most valuable asset in this territory is the slate, which exists in practically inexhaustible quantities, and is said to be of the highest quality. These deposits are on Abrams Creek, two miles from the present terminus of the road, which is at the mouth of Abrams Creek, on the Little Tennessee River. Years ago one of these quarries was operated and the slate was hauled to the Little Tennessee River on a wooden tramroad, and there put on barges and floated to Chattanooga in times of tides in the river, and it was used for roofing and other purposes. Many of the best roofs on several of the most expensive houses in Chattanooga are of this slate. This method of transportation was found to be too expensive, and the operation of the quarries were abandoned some years before the construction of the road was commenced. It is expected that these quarries, or some of them, at least, will soon be put in commission again.

A company has been organized, of which Col. Chas. H. Treat, Treasurer of the United States, is president, to build a dam on the Little Tennessee River. Years ago pose of furnishing electric power to all of the manufacturing concerns that are now or may hereafter be located in that territory, as well as to the city of Knoxville. The purpose is to construct this dam by means of a tunnel through a spur of the mountain around which the river makes a bend of some three miles, but by cutting a tunnel something like 2500 feet through the mountain a splendid fall can be had and power enough secured to serve a city of a quarter of a million people. It is proposed to commence work on the construction of this dam during the approaching summer, provided about five additional

miles of railroad are constructed so as to haul material to that point.

All of the owners and operators of timber and timber lands in that section are in favor of maintaining the present tariff on wood and lumber. No section of the South promises greater returns in the immediate future than this particular section.

JESSE L. ROGERS.

Knoxville, Tenn.



Hibernia Bank and Office Building, New Orleans; 13-story, steel construction, fire-proof building; completed and occupied 1904; cost \$1,000,000; entire ground floor occupied by various departments of Hibernia Bank and Trust Co.

USERS OF CEMENT.

Program of the National Association's Convention.

The fifth annual convention of the National Association of Cement Users, which is to be held in Cleveland, Ohio, January 11-16 will, from all indications, excel all previous ones both in point of numbers and in importance of the subjects to be discussed. In an elaborate program provided the various papers will deal largely with the cost of concrete construction, rates of insurance on concrete structures and a suggested building code for concrete and reinforced concrete. These are among the most important matters facing the users of cement today. Each subject will be covered by papers to be read by men who have daily experience in such matters and have given close study to them. The discussions following, by users of cement from all parts of the country, will also throw much additional light on the various subjects, so that it is not unreasonable to expect that some definite action will be taken by the association that will be of real value to every man in the industry. Among the papers to be read are:

"Cost and Value of Cement Roads," by J. H. Chubb, Chicago, Ill.

"Cost of Reinforced Concrete Construction as Applied to Buildings," by Leonard C. Wason, president Aberthaw Construction Co., Boston, Mass.

"Comparative Cost of Reinforced Concrete Buildings," by Emile G. Perrot of Ballinger & Perrot, architects, Philadelphia, Pa.

"Cost of Reinforced Concrete Construction as Applied to Bridges," by E. P. Goodrich, consulting engineer, New York, N. Y.

"The Availability of Concrete for Bridges—Its Cost and Durability," by H.

H. Quimby, engineer of Bridges, Philadelphia, Pa.

"Decorative Concrete Stone," by F. A. Norris, Boston, Mass.

"Reinforced Concrete Residences," by B. A. Howes, Jr., New York, N. Y.

"Small Concrete Houses—Manufacture and Cost," by R. C. Knapp, Philadelphia, Pa.

"Monolithic Concrete Wall Buildings—Methods, Construction and Cost," by Col. Robert H. Aiken, Chicago, Ill.

"Advantages of Reinforced Concrete for Railroad Construction," by B. H. Davis, assistant engineer D. L. & W. R. R., Hoboken, N. J.

"Cold Storage Warehouses of Reinforced Concrete Construction," by J. P. H. Perry, Turner Construction Co., New York, N. Y.

"The Applicability and Comparative Cost of Concrete and Reinforced Concrete for Subway Construction," by Chas. M. Mills, Philadelphia Rapid Transit Co., Philadelphia, Pa.

"Value and Cost of Reinforced Concrete for Retaining Walls," by A. Lindau, Corrugated Bar Co., St. Louis, Mo.

"Methods of Attaching Shafting and Machinery in Reinforced Concrete Buildings," by W. M. Bailey, chief engineer Eastern Concrete Construction Co., Boston, Mass.

"Value and Cost of Steam Curing of Concrete Blocks," by F. S. Phipps, manager Central Stone Co., St. Joseph, Mo.

"The Present and Future of the Cement Block—Its Cost, Manufacture and Availability," by J. A. Smith, Ideal Concrete Machinery Co., South Bend, Ind.

The proceedings of the convention will be held in the Hotel Hollenden. In accordance with the usual custom, there will also be at the same time an exhibition of cement machinery and products. This will be held in the Central Armory, one of the largest buildings in the city. Already the main floor is entirely taken up and nearly all of the available space in the gallery, so that a full and representative exhibition is assured. This year for the first time the exhibits will be classed and grouped, thus affording a far better opportunity for the observer to compare the relative merits of the various types of machinery.

Winchester, Ky.

[Special Cor. Manufacturers' Record.] Winchester, Ky., Jan. 4.

Our city of 10,000 inhabitants is situated near the central part of the State. The soil is of the best, tobacco being the principal crop. We are within easy reach of the vast undeveloped coal and iron fields of the Kentucky Mountains. The Lexington & Eastern Railroad taps those fields in the east, and the Louisville & Nashville on the south. We are within one hour and a half of Cincinnati and Louisville. The building trades are always busy; we had no money panic in the past year, and we have at present under construction a \$40,000 church and a \$30,000 fraternity building. The site has been selected for an \$80,000 Federal building, and the prospects for building in the coming season are the best within the history of the town; factories of every description are always shown every courtesy and home capital is ready to invest in legitimate enterprises; no corporation taxes are imposed for five years. A brick plant and a furniture factory would do well to investigate conditions here.

W. W. STEVENSON.

An address by Mr. John Birkinbine of the Birkinbine engineering offices, Philadelphia, on the conservation and utilization of natural resources has been republished in pamphlet form from the *Journal* of the Franklin Institute.

Building at Chattanooga.

[Special Cor. Manufacturers' Record.]

Chattanooga, Tenn., January 2.

Chattanooga architects are quite confident. Many of them already have a good volume of work on hand which will be ready for proposals in time to award contracts early in the season.

The Fuller Combing Gin Co., James T. Fuller, president, which has just removed to the News Building, has awarded the contract to Hale & Bitting, contractors, 2 Chamberlain Building, to erect its new two-story main factory building at Ross-ville, Ga. (a suburb). This building, which will be 60x230 feet in size, is of especial interest because it is a type of the modern factory building showing the increased use of reinforced concrete in its composition. The walls and floors will be of reinforced concrete. The roof will be of the same material, supported on concrete beams on concrete pillars. This contract does not include the drykiln, water supply, fire protection, automatic sprinklers, lighting and elevator.

E. R. Betterton and J. O. Martin of E. R. Betterton & Co. have been considering the question of building a hotel building at the corner of Market and Alabama streets. They did not decide anything definitely until this week, when they made a lease for a long term of years to C. A. Brelsford. In about six months, when the building is completed, Mr. Brelsford will operate the hotel on the European plan. It is to cost \$40,000, and will have five stories and basement, to be built of brick, stone and concrete. The size will be 55x150 feet, containing 75 rooms. The floors will be of concrete. The hotel will be almost opposite the new Chattanooga railroad station, and will have all of the modern improvements, making it attractive to travelers.

The West Construction Co. has received contract from J. T. Lupton to build the three reinforced concrete floors for his new \$100,000 private residence at Riverview (a suburb). It has also received a contract from the Chattanooga Station Co. for \$2000 to construct two lunch counters for the lunchrooms in the new railroad station. Each counter will be built of angle iron and reinforced concrete 30 feet long and 5 feet high. The front will be faced with white enamel and gold-decorated tile. The tops will be of Italian white marble. The same kind of marble will be used for the shelves under the counters and for the tops of stands for drinking glasses. They will thus be as sanitary as counters can be made.

George Baker Long, a contractor in the News Building, received the \$80,000 contract from the State of Kentucky to construct the stone, brick and reinforced concrete terraces for the new State Capitol at Frankfort, Ky. He has awarded the subcontract for the cut-stone facing, 1400 feet long and 10 inches thick, for the parapet wall, to James Dutton, a stone contractor in the News Building, for \$34,000. The subcontract has not yet been awarded for the reinforced concrete construction of the rooms in the terrace or of the vitrified brick paving on top. T. B. COLBURN.

The Eastern Carolina Rivers and Harbors Congress in its second annual session at Columbia, S. C., elected Messrs. William D. Morgan of Georgetown, president; Henry Mullins of Marion, vice-president; H. B. Springs of Georgetown, secretary and treasurer, and William Godfrey and H. P. Duvall of Cheraw, C. J. Shannon, Jr., and L. A. Wittkowsky of Camden, August Kohn, W. J. Murray and L. B. Dozier of Columbia, C. N. Davis of Summerton and Melver Williamson of Darlington, directors.

LUMBER

[A complete record of new mills and building operations in the South will be found in the Construction Department.]

BUILDING RECORD GOOD.

Review of Southern Operations in 1908.

As showing little, if any, effect of the recent industrial depression, a brief review of building operations throughout the South and Southwest during the past year is interesting. Figures obtained from a number of representative cities in these sections indicate that while some localities have shown a decrease in operations during 1908 as compared with previous years, the larger number have shown records equally as good as those of other years, and in several important cities a marked increase is noted. Among these are Norfolk, Richmond, Charlotte, Atlanta, Savannah, Birmingham, San Antonio and other cities.

Perhaps the greatest step which has marked the industrial growth of Norfolk during the past year is her progress in building operations, which have shown a gain over the previous year of \$775,882. The aggregate cost of buildings for which permits were issued in 1908 is estimated at \$2,101,712, as against an aggregate of \$1,325,830 for 1907. Among the important structures erected are the Naval Y. M. C. A. Building, costing \$250,000; Dickson Building, \$150,000, and the building for the Virginia Bank for Savings and Trust, costing \$190,000. Building prospects for 1909 are exceptionally bright and plans have already been prepared or are being prepared for several important buildings.

As far as is apparent from official figures of Building Inspector H. P. Beck, the value of operations in Richmond for 1908 has exceeded that of any other year in the city's history. The estimated cost of new improvements aggregate \$2,888,604, and of repairs and additions \$280,827, making a total of \$3,169,431. Permits were issued for 273 brick dwellings and 295 frame dwellings, ranging in cost from \$1000 to \$85,000 each. Important structures include one high school, erected at a cost of \$339,233; 13 warehouses and factories, costing in the aggregate \$150,975; four halls, costing \$86,600; four churches, costing \$39,508; Y. M. C. A. building, costing \$180,000; hospital, \$4000; apartment-house, \$4000, and numerous other structures.

Operations in Charlotte, N. C., were marked by much activity, and it is estimated that the value of buildings for which permits were obtained will exceed \$1,000,000. Among the important structures finished during the year or are in course of erection are the Realty Building, costing about \$375,000; Charlotte Sanitarium, \$100,000; Y. M. C. A. building, \$125,000; Stonewall Hotel, \$75,000; First Baptist Church, \$50,000; Lawyers' Building, \$60,000, and numerous others.

Operations were also active in Greensboro, and among the structures erected or begun are 234 residences, estimated to cost \$267,060; two churches erected and three enlarged at an aggregate cost of \$24,250; five factory buildings erected; two livery stables costing \$8000, and 19 business structures costing about \$100,000.

Another city whose building record for 1908 exceeds that of any previous year is Anderson, S. C. For the erection of residences, stores, warehouse, office buildings, etc., it is estimated that \$350,000 was expended. The more important structures include the Mulkey-Ramsey-Tramwell Building, People's Building, Brown-Shirley Building and the Hubbard Building.

Building operations in Atlanta during 1908 show a substantial increase over

those in 1907. For 1908 an increase of \$278,970 is noted over 1907, the official figures being \$4,833,941 for 1908, as compared with \$4,554,971 for the preceding year. A total of 4169 permits was issued in 1907 and 4153 during 1908.

There has been no building boom in Savannah, yet operations in that city have shown a steady growth, with no indications of abating. A total of 374 permits was issued during the year, representing an estimated value of \$1,000,000. Nearly every section of the city has shown improvement, and many costly structures, including residences and business buildings, have been erected.

The report of the building inspector for Macon shows a total of operations for the year of 237 permits, with a valuation of \$344,203.50. These figures include three permits for brick stores, valued at \$28,920; eight for frame stores; four for brick dwellings, valued at \$41,000; 117 for frame dwellings, valued at \$17,500; nine for structures other than stores, valued at \$43,336; 70 for additions and alterations, valued at \$45,757.50, and 25 for miscellaneous structures, valued at \$8111.

Statistics from Birmingham indicate that the value of operations in that city for the year just closed exceeds that of any previous year. More than 1100 permits were issued during the year, representing an estimated value of \$2,561,754. As compared with 1907, these figures show an increase of more than \$600,000. Among the important buildings which are in course of construction are the addition to the Brown-Marx Building, the Empire Building, Chamber of Commerce Building and a structure for Louis V. Clark.

In Jacksonville permits were issued for 819 new structures, estimated to cost \$2,075,500. Of this number, 73 were for buildings of brick and stone construction and 746 for frame structures. As compared with the record for 1907, these figures show a decrease of 197 in the number of permits and nearly \$1,000,000 in the cost of construction. But, while not so many buildings were erected in 1908 as in the previous year, in many instances those erected were of a finer character and better construction. Since the fire of May, 1901, which destroyed about 2600 buildings, valued approximately at \$15,000,000, there have been erected 8,242 structures, including residences and business buildings, having a total estimated value of \$23,004,177.

Operations in Tampa, Fla., for the first eleven months of 1908 represent a valuation of \$876,419.85, with indications that official figures for December will increase the total for the year to an amount exceeding \$1,000,000. Structures for which permits were obtained represent nearly every class of building, ranging in cost from cottages costing \$350 each to a club building costing \$75,000. Other buildings include warehouses, factories, residences and miscellaneous structures.

Building operations have been unusually active in Chattanooga and vicinity, and this is the more remarkable, as no permits have been issued for any very large buildings, the Young Men's Christian Association building being the largest. Official figures are not available, but a careful estimate indicates that the value of operations for the year will aggregate \$1,250,000 within the city limits and about \$1,200,000 in the suburbs. Of this it is estimated that \$400,000 has been expended for suburban cottages; residences have been erected or contracted for on Mission Ridge to the value of about \$150,000; Lookout Mountain will add about \$50,000, while operations at Riverside will aggregate approximately \$600,000.

Operations have fallen off considerably

in Knoxville, as compared with the two preceding years, comparative figures being about \$500,000 for 1908, as against \$1,200,000 in 1907 and \$1,500,000 in 1906. While this is true of the city, the decrease has not been so marked in the suburbs, as many new houses have been erected during the year, particularly in Park City. Indications point to much activity in building during 1909.

In St. Louis operations for 1908 were hardly less extensive and valuable than in 1907, the figures for 11 months and 23 days of December, 1908, being \$20,601,040, as compared with \$21,895,157 for 1907. A noteworthy fact in connection with the building record for 1908 is that the cost of structures for educational and religious purposes aggregates about \$2,000,000. The total cost of structures erected by the city during 1908 is estimated at \$1,201,600, while the city work contemplated for 1909 is estimated at \$6,466,500. Included in this is work advertised and for which contracts will be awarded about January 15 to the amount of \$142,000.

Progress and development have marked building operations in San Antonio during the past year. Nearly every month has shown a substantial increase over the corresponding month in 1907, while the total for 1908, with figures for December incomplete, exceeds that of the preceding year more than \$400,000. Based upon the permits issued, the total value of operations in 1908 is estimated at \$2,377,120, as compared with \$1,951,393 for 1907. The figures for 1908, however, should be augmented about \$1,000,000, as this is the estimated cost of the San Antonio Hotel Co.'s new hotel, the construction of which is in progress, but a permit has not as yet been issued.

The record of El Paso has been very good, and prospects for the coming year are exceptionally bright. Official figures for 1908, except a few days in December, show an aggregate of about \$1,500,000. There are many large buildings under construction, and architects report that they are preparing plans on which estimates will be invited early in the coming year. One of the most important of these enterprises will be the erection of the proposed packing plant for J. H. Nations and associates, to cost about \$100,000.

Notwithstanding adverse conditions, building operations in Little Rock for the year have been extensive and compare very favorably with the preceding year both in valuation and character of construction. For the year ended December 31, 1907, the value of buildings for which permits were issued was estimated at \$1,021,658, and for the 11 months of 1908—from January 1 to November 30, inclusive—to \$901,714. The difference between these figures will probably be exceeded by December operations, figures for which are not now available. Among the more important structures for which permits were obtained during the year are the Lincoln School, costing \$31,000; Carnegie library, \$71,000; Bishop Morris Building, \$35,000; Penbody School annex, \$26,500; Terminal Hotel, \$28,000, and remodeling the Capitol Hotel at a cost of \$50,000.

From January 1 to December 31, 1908, building operations have fallen off about \$1,000,000 in Baltimore as compared with figures for 1907. Official statistics for 1908 show a total cost of construction for new work and additions estimated at \$6,295,590.90, of which amount about \$3,000,000 was expended for the erection of residences, \$600,000 for factory buildings, \$95,000 for stores, \$35,000 for churches, \$215,000 for a public building, \$150,000 for a grain elevator, \$300,000 for a sewerage pumping station, besides numerous other structures.

Big Timber Development Enterprise.

The MANUFACTURERS' RECORD is advised of plans for an important timber development enterprise in Florida. This enterprise is announced by the Dekle Investment Co. of Tampa, Fla., which has purchased and will develop a 14,000-acre tract of yellow pine timber near Tampa, expecting to mill at least 60,000,000 feet of lumber. The company will at once begin the erection of a saw and planing mill to be equipped for cutting about 25,000 feet of lumber daily, and with flooring and timber machines, etc. It is now inviting estimates on the mill machinery, and will also purchase a 25 to 30-ton locomotive with logging trucks, from three to five miles of 30 to 40-pound rails for logging purposes, and other materials.

Inspection Rules for Yellow Pine.

The second edition of a little booklet of sketches showing necessary heart in yellow pine lumber, according to the 1905 interstate rules, is being distributed among the trade by the Heard Lumber Co., Inc., Savannah, Ga. The inspection and classification rules are also included in the publication, making it altogether very much to be desired by those interested in the lumber industry.

Lumber Notes.

The Evansville (Ind.) Veneer Co. is reported to be making active preparations for the erection of a large veneer factory at Memphis, Tenn. It is stated that the company has purchased a large tract of land on the Belt line, near the new right of way into Memphis of the Illinois Central Railroad, and will erect a five-story structure for the installation of the plant, together with a number of cottages for the operatives.

It is announced that the Kettle Creek Company of Indianapolis will purchase 20,000,000 feet of lumber from mills in the vicinity of Hattiesburg, Miss. The lumber will be shipped from the mills in full length to the company's plant at Indianapolis, where it will be crosscut and cut into paving blocks.

Castor Oil and By-Products.

The MANUFACTURERS' RECORD is informed that a plant will be established for manufacturing cold-pressed castor oil and such by-products as fertilizers, lubricating oils, etc., at Miami, Fla. C. J. Rose of Miami is promoting the enterprise, and will incorporate a company. He has engaged B. F. Davis of Miami as architect in charge, and will erect buildings, 40x100 x20 feet, of concrete blocks, practically fireproof. Hydraulic presses, oil-refining machinery, a power plant (steam, gasoline or electric) and other equipment will be installed. Mr. Rose will be in the market for the power plant.

Through the kindness of Mr. J. S. Cock, an engineer of Christiania, the MANUFACTURERS' RECORD has received a copy of a beautifully illustrated publication, designed to promote tourist travel in Norway. It is entitled "Through Norway—Folk-Life in the Land of the Midnight Sun," and describes in an interesting way both in English and in Norse the most attractive sections of Norway. The description is illuminated by a profusion of half-tone reproductions of photographs of persons and places, giving a clear idea of the country and its people, and calculated to inspire one with a desire to study them at close range. The artistic publication from cover to cover is the product of Christiania, and is issued by the Norwegian Tourist Traffic Association.

RAILROADS

[A complete record of all new railroad building in the South will be found in the Construction Department.]

WILL SPEND A MILLION.

Norfolk & Southern Receivers to Build Bridges, Tracks, Stations, Etc.

The receivers of the Norfolk & Southern Railway have been granted authority by the court to issue \$1,000,000 of receivers' certificates for improvements, repairs, maintenance, etc. The securities will bear 6 per cent. interest, and they have been sold.

Much construction is contemplated by the receivers, the most extensive piece of work being the completion of the long bridge over Albemarle Sound, which will cost \$580,000 to finish. The next largest item is one of \$119,000 for improvements to the permanent way, stations, grounds, etc., on the Raleigh division. There is also to be spent at the Newbern machine shops \$65,000 for facilities, tools and equipment. At Norfolk an office building costing \$50,000 is to be erected on Water street, while \$30,000 will be spent for a freight house on the same thoroughfare. Several thousands will also be spent to remodel the present Water-street freight depot and office. There is also set aside \$12,500 for furniture and fixtures in the new office building. The Pinetown cut-off from Pinetown to Bishop Cross, N. C., is to be completed at a cost of \$36,000. Other items of expense to be undertaken are these: New car float bridge at Berkeley, \$10,000; enlarging yard tracks at Berkeley, \$10,000; steel bridges to replace wooden, \$17,500; side-track at Bayboro, N. C., \$5000; improvements to passenger station at Newbern, \$6000; to improve warehouse at the same place, \$5000, with an equal amount for yard tracks. The Beaufort trestle bridge will require \$15,000 for repairs, and \$5000 are needed to change the draw at Lynnhaven inlet. Several smaller sums are to be spent at Farmville, Washington, Stantonburg, Bayles, Simpson, Nevison, Zebulon and Greenville, N. C., respectively, for tracks, stations, etc.

Baltimore & Drum Point Railroad.

An extension of time of one year has been granted to Edward Lauterbach of New York to begin work on the projected Baltimore & Drum Point Railroad, for which he has had charter rights for about 20 years. Within the past year some residents of Anne Arundel county, Maryland, started a movement to build a railroad along the route proposed for the Drum Point line, and Mr. Lauterbach claimed that he had large pecuniary interests in the old road, upon which about \$500,000 had been spent for grading from Millersville, Md., on the Annapolis, Washington & Baltimore Railroad, southward toward Drum Point, and, upon his appeal, a hearing of both sides in the case was held and finally the extension of time was granted.

John C. Rose of Baltimore, counsel for Mr. Lauterbach, says that his client will either complete the road himself or will negotiate with other parties who might desire to take over and finish the property. He hopes that long before the expiration of the year construction will be well under way.

When the Baltimore & Drum Point Railroad was started local subscriptions to the bonds were secured from at least one of the counties through which it will pass. This subscription will lapse within a year if the terms of the subscription are not met by the promoter. On account of the agitation which has been started by the Anne Arundel county people, including James W. Owens of Annapolis and others,

it is expected that active work on the road will begin this year.

KANAWHA TO CHESAPEAKE.

Virginian Railway Practically Finished and Can Soon Operate Through Trains.

The Virginian Railway, Henry H. Rogers' new line across Virginia and a large part of West Virginia, is practically completed, according to a report from Norfolk, Va., where the headquarters of the company are situated. The only thing remaining to be finished is some steel work upon the bridge over New River, to be completed in about two weeks, when the road from Sewell's Point, at Norfolk, Va., to Deepwater, W. Va., on the Kanawha River, 442 miles, will be ready for through trains. It will require about six weeks more to finish the coal pier at Sewell's Point, and, while some coal may be hauled over the line before the pier is done, there will not be handled any considerable amount of coal traffic, for which the road was primarily constructed, until the terminal facilities are finished. The cost of the railroad is stated as \$40,000,000, and the cost of the pier, which is 1200 feet long, is said to be about \$2,500,000.

The principal features of this new railroad are its easy grades and its substantial construction. At Princeton, W. Va., 350 miles west of Norfolk, is the yard where coal cars will be made up into trains bound for Norfolk, and Raymond DuPuy, vice-president and general manager, and H. Fernstrom, chief engineer, are reported as saying that there can be hauled from Princeton to Norfolk with one locomotive 80 coal cars, each loaded with 50 tons of coal, a load of 4000 tons of freight alone, not considering the weight of the cars. The maximum grade between Princeton and Norfolk is only two-tenths of 1 per cent., or not more than 10½ feet to the mile. This fact demonstrates the great operating capacity of the road. Mr. Fernstrom is further reported as saying that it is proposed to haul trainloads of 4000 tons, and that the Virginian Railway, if it set about hauling the several million tons of coal which now comes to Hampton Roads by various roads each year, could haul that much by running only six trains a day; also, that the road could run 20 coal trains a day without trouble, and that other trains could run between them. This is at present, before the line has a double track.

The bridge over New River, upon the completion of which about January 15 the through operation of the road depends, is 2155 feet long and cost, it is said, nearly \$300,000. It has concrete piers, with steel superstructure. At their bases the piers are 16 feet thick and 48 feet wide. From the bed of New River to the track at the highest point is a distance of 129 feet. Farther up the line, however, is the viaduct over Black Lick Creek, which is 192 feet high above the bed of the stream. It is, however, a shorter bridge than the other, being only 910 feet long.

Construction was recently started by the Virginian Railway Co. upon its Winding Gulf branch, from Mullins, W. Va., to Pemberton, W. Va., 24 miles. This new road is expected to add considerable to the already promised heavy coal tonnage of the Virginian Railway, which will haul from mines of the Gauley Mountain Coal Co. of Ansted, W. Va., and also from other collieries connecting with the main line.

Big Contract for Signals.

The St. Louis & San Francisco Railroad is reported to have let a contract to the Union Switch & Signal Co. for 1200 automatic block signals on 700 miles of single track and 25 miles of double track. These signals will be placed between St.

Louis and Monett, Mo.; between Kansas City and Springfield, Mo.; between Springfield and Thayer, Mo., and between Amory, Miss., and Birmingham, Ala. They are to be installed and in operation within a year.

Building On to Key West.

An official letter to the MANUFACTURERS' RECORD says:

"The Florida East Coast Railway Co. is resuming construction below Knights Key, Fla. The Key West extension is now completed to the latter point, leaving 45 miles to be constructed. A large portion of the roadbed included in this distance is already finished and is ready for tracking. The most of the roadbed to be constructed will be put up by dredge work. There are three bridges—one of 6800 feet at Knights Key, one of 7700 feet at Moser Channel and one of 4000 feet at Bahia Honda—involving concrete substructure and steel superstructure. None of this work is to be contracted, but all will be done by company labor."

The continuation of the building of the Key West extension of this road is under the supervision of Mr. J. C. Meridith, constructing engineer, who had charge of the work on the sections north of Knights Key, which place is 478 miles south of Jacksonville, so that the completed line to Key West will be about 525 miles long. The official letter confirms the previous reports that the bridges south of Knights Key, instead of being made altogether of reinforced concrete, as were the bridges north of that place, will be of reinforced concrete piers, with steel bridging laid on top thereof. This, it is said, will prove quite as efficient as concrete throughout, and the adoption of this method will facilitate construction.

After the road is finished to Key West it will have about 125 miles of "seagoing track," as it has been called, from a point near Homestead, where the line leaves the mainland, along the islands to the southern terminal.

Tough Rails for Use on Curves.

Rails made of extraordinarily hard and tough metal are a result of the application of Manard steel to the production of railroad material, according to a circular issued by the Pennsylvania Steel Co. Hitherto this variety of steel has been used in castings for frogs, switches and street railway "special work," parts of dredges, crusher jaws, coal-breaker rolls, etc., or wherever severe wear and shock were to be borne. The nature of this steel made it difficult to roll for rails, but after years of experiment and investigation a process was devised so that rails of Manard steel are now rolled in lengths of either 24 or 33 feet. It is said they are so tough that a 100-pound to the yard section 33 feet long was twisted until the head of the rail was completely wrapped around with the flange, and that when the pressure was released two complete twists remained in the rail permanently; also that a similar section showed its shock-resisting abilities by sustaining repeated drop tests until bent into the form of a V, this representing a dynamic force of 150,000-foot pounds. Yet these rails are so ductile that test bars forged from the head show a tensile strength of from 150,000 to 159,000 pounds per square inch, and still elongate 50 or 60 per cent. in eight inches. While they cannot be machined, they may be bent into any curve by the ordinary carving tools employed by trackmen. It is further said that they are particularly strong at the joints where the bolt holes are bored, as compared with either Bessemer or open-hearth process rails. While the cost of the Manard steel rails is approximately \$150 per ton, it is claimed that their use

at points on a line where particularly severe wear is experienced, as at curves, will prove economical and will insure the maintenance of track at a high standard of efficiency and strength. R. C. Hoffman & Co. of Baltimore are agents for the manufacturers.

A Composite Tie.

J. H. Houck of Atlanta, Ga., informs the MANUFACTURERS' RECORD that a company will soon be organized to manufacture a railroad tie which he has invented and patented. The tie can be made of vitrified clay or of steel or iron. If made of clay, it would consist of three hollow sections, each 2 feet 8 inches long, 9 inches deep and 11 inches wide, and having a creosoted timber 8 feet long, 5 inches deep and 7 inches wide through their centers holding them together in the form of a tie. The clay sections would be provided with oblong slots, through which the rail spikes could enter the wood. The wooden portion of the tie is cemented in place, thus making a tie of practically one solid piece.

If the tie is to be made of steel or iron, two sections are provided, each 4 feet long, 6 inches deep and 8 inches wide. Through these the wooden core is placed, as in the manufacture of the clay tie. One section of each metal tie has a casting to prevent the rails from spreading, and on the bottom of each block is a projection to enter the ballast and prevent the tie from crawling or slipping.

Mr. Houck claims that his tie has elasticity; that it is indestructible; that it will not crawl or creep on the ballast, and that the rails will be held in position by spikes as usual. It has been commended as practical by experts.

Shawnee to Muskogee and Lawton.

Mr. C. J. Benson, Shawnee, Okla., writes the MANUFACTURERS' RECORD that survey has been made for the Shawnee Central Railroad from Shawnee to Muskogee, Okla., and that surveys from Shawnee to Lawton, Okla., will be completed this coming summer. It is hoped to begin construction upon the line from Muskogee to Shawnee this year. F. H. Peckham is chief engineer. Construction contracts will not be let for a while. Connection will be made with the St. Louis & San Francisco Railroad at Weleetka, or some point near there, and with the Missouri, Kansas & Texas Railway at Muskogee. The line will run through a rich, fertile valley and will follow the North Canadian River for about 60 miles. J. M. Aydelotte is president, J. W. Rubey vice-president, C. J. Benson general manager and S. J. Roys secretary.

C. P. Taft Not Building a Railroad.

Concerning a press report that he was interested in a plan to build a railroad from Aransas Pass to Eagle Pass, Texas, Mr. Charles P. Taft of Cincinnati writes the MANUFACTURERS' RECORD that he is not a stockholder in any such railroad and does not expect to be interested in the enterprise.

Continuing, he writes: "We own a ranch in Dimmit county, Texas, and it is proposed to build a railroad from the International & Great Northern line west through this ranch. If the road is completed I am to pay a certain bonus."

It would appear that this connection with the contemplated railroad through his land is all the basis existing for the report that Mr. Taft was connected with a large railroad enterprise.

Sale of a Railroad Reported.

Dispatches from Beaumont, Texas, announce the purchase by R. C. Duff, representing B. F. Yoakum and a syndicate, of the Beaumont & Great Northern Railroad, 34 miles long from Trinity to Liv-

ington, Texas, and which, it is said, the syndicate will use for part of a short line between Beaumont and either Dallas or Fort Worth, Texas. Other railroad properties may be acquired and similarly utilized. The Beaumont & Great Northern is owned by lumber interests, its president being William Carlisle, and its vice-president George W. Pennell, both of Atchison, Kans. It has for some time projected an extension from Livingston to Beaumont, 65 miles, and perhaps a further extension to Sabine Pass, Texas.

Galveston Causeway Assured.

A report from Galveston, Texas, says that the Gulf, Colorado & Santa Fe Railroad Co. has agreed to sign the contract for a causeway over Galveston Bay, and the construction of that work is now assured, as it only required an agreement with the Santa Fe to complete the round of agreements of the various lines entering Galveston. This causeway is designed to provide a bed for steam railroad tracks, electric railway tracks, wagon roads and footpaths, as heretofore described.

Railroad Notes.

Mr. L. Green, freight traffic manager of the Southern Railway, announces that, owing to unavoidable delays, the company will not be able to put in use the uniform bill of lading until February 1. It had been proposed to begin its use on the first of the year.

W. H. Coffman, according to a report from Bluefield, W. Va., has just completed a test piece of track for the Bluestone Traction Co., the rails being laid on steel ties invented by him. He is said to claim that his steel ties are particularly valuable for tracks in mines, giving the horses or mules, which haul the mine cars, a better foothold, and also permitting a greater amount of headroom than wooden ties.

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J. M. Hood, Jr., has been appointed chief engineer of the United Railways & Electric Co. of Baltimore to succeed Charles O. Vandevanter, who has resigned. Mr. Hood is the son of the late John M. Hood, who was president of the company.

The Southern Railway announces the following appointments: J. J. Seay, commercial agent, Rome, Ga.; C. T. Cope, traveling agent, Rome, Ga., vice J. J. Seay.

H. M. Atkinson, president, and P. S. Arkwright, vice-president, of the Atlanta, Birmingham & Atlantic Railway Co., have been appointed receivers for it in consequence of the default of interest on the bonds. The effects of the panic are said to have been the cause of the company's financial difficulties, and the receivership is a friendly one, to be continued until the property, which is now being completed, is able to meet its other payments.

In an attractive pamphlet has been published the stenographic report of the proceedings at the Missouri River Dinner given at Chicago last fall to the delegates from Missouri River cities to the Lakes-to-the-Gulf Deep Waterways Convention. It contains addresses by Congressman Joseph E. Ransdell of Louisiana, Congressman J. H. Davidson of Wisconsin, Congressman Edgar C. Ellis of Missouri, Mr. Lawrence M. Jones, Col. John F. Richards, Col. John I. Martin and Ben Blanchard of Kansas City.

TEXTILES

[A complete record of new textile enterprises in the South will be found in the Construction Department.]

Correspondence relating to textile matters, especially to the cotton-mill interests of the South, and items of news about new mills or enlargements, special contracts for goods, market conditions, etc., are invited by the MANUFACTURERS' RECORD. We shall be glad to have such matters at all times, and also to have any general discussion relating to cotton matters.

Southern Spindleage Advance in 1908.

In common with other branches of manufacturing, the Southern cotton-mill industry has been somewhat backward during the past year, because of the unsatisfactory conditions in the financial world, as has been evident in the week-to-week announcements and the quarterly reviews presented by the MANUFACTURERS' RECORD. But indications of a return to the normal activity of building new mills and adding to established plants have been noticeable during the past three months.

An important feature of these promising signs is the fact that the men most versed in the possibilities of cotton manufacture in the South, that is, the experienced mill-owners and managers of the section, are the leaders in the investment of capital in the installation of spindles and looms for the production of yarns and cloth. This is a fact to which the MANUFACTURERS' RECORD has frequently called attention, and for some years past more spindles have been purchased by the experienced mill-owners than by men new to the industry.

Notwithstanding the deterrent conditions of the year, the record of 1908 is a creditable one as regards the progress indicated by increases in spindleage. For the fourth quarter of the year the total of spindles announced as to be placed in position is a decided advance over the third quarter, while the first and second quarters' announcements are about doubled. For instance, the spindles announced during October, November and December as to be installed in Southern mills is 56,908, which will require the investment of approximately \$1,430,000, of which about \$300,000 is for enlarging to the extent of 11,500 spindles and \$1,130,000 is for equipping new mills with 45,408 spindles. These figures include the necessary buildings and machinery complementary to the spinning equipments.

The total for the year is 147,808 spindles, which means an investment of about \$3,700,000.

For several years past important progress has been made in the adoption of electricity for driving Southern mills, and during 1908 this movement has steadily continued. It is worth while noting in this connection that the Southern Power Co. of Charlotte, N. C., is now supplying electricity for power to more than 100 cotton factories in the leading cotton-mill centers of North and South Carolina.

The general textile news of the year has contained many reports of interest besides the announcements of new and enlarging mills, including references to plants completed or approaching completion. From time to time the MANUFACTURERS' RECORD has presented this news, and may again briefly mention the most important items, as follows: Completion of Ide Cotton Mills addition, 25,000 spindles, Jacksonville, Ala.; Tallapoosa Mills completed, 10,000 spindles, Tallapoosa, Ga.; Coosa River Spinning Co., 10,000 spindles, mill completed, Bon Air, Ala.; Union-Buffalo Mills, replacing old weaving machinery with 2000 automatic looms, Union, S. C.; Kerr Bleaching and Finishing Works, contracting to rebuild plant, Charlotte, N. C.; Cromer Bros., contracting for mill to manufacture silk ribbons, Hagerstown, Md.;

Revolution Cotton Mills, contract for plant to bleach product of company's 30,000-spindle and 800-loom canton flannel mill, Greensboro, N. C.; Unity Cotton Mills, to expend \$400,000 to \$500,000 to duplicate plant, LaGrange, Ga.; Saxon Mills, to add 10,000 spindles and 350 looms, Spartanburg, S. C.; Loray Mills, contracting for 3000-horse-power electrical equipment, costing about \$65,000, to drive 57,800 spindles and 1680 looms, Gastonia, N. C.; West Point (Ga.) Manufacturing Co., completing 35,000-spindle addition, warehouse, cottages, 3000-horse-power electric plant, etc., representing an investment of from \$800,000 to \$1,000,000; Raleigh Cotton Mills, Pilot Cotton Mills and Caraleigh Mills, contracting for electric power to drive their 33,000 spindles and 761 looms, Raleigh, N. C., etc.

Following is a tabulated list of the title, location and equipment of the various companies announced as organized for building plants and of established enterprises deciding to enlarge during October, November and December:

Alabama.			
Name.	Location.	Spindles.	Looms.
A. D. Wood.....	Columbia.....	5,000	150
Georgia.			
Manchester Cotton Mills.....	Manchester.....	20,000	....
*Thomaston Cotton Mills.....	Thomaston.....	5,000	....
*Capps Cotton Mills.....	Toccoa.....	2,000	....
		27,000	....
Kentucky.			
Bradford Worsted Spinning Co.....	Louisville.....	3,200	....
North Carolina.			
Dacotah Cotton Mills.....	Lexington.....	8,208	250
J. W. Watts.....	Stony Point.....	4,000	....
A. Cameron.....	Vass.....	5,000	....
*Scotland Cotton Mills.....	Laurinburg.....	2,000	....
*Nokomis Cotton Mills.....	Lexington.....	500	16
		19,708	266
South Carolina.			
*Watts Mill.....	Laurens.....	2,000	....
Total.....		56,908	416
Total for first quarter.....		21,900	....
Total for second quarter.....		23,000	300
Total for third quarter.....		46,000	906
Total for fourth quarter.....		56,908	416
Total for year 1908.....		147,808	1621
*Established mills enlarging.			

Cotton Facts.

That standard publication, invaluable to everybody interested in the many phases of the cotton trade, "Cotton Facts," by Col. Alfred B. Shepperson of New York, has appeared in its edition of December, 1908. It continues to the close of the cotton season of 1907 and 1908 all the statistics of previous issues, while some figures are as late as of December 4. Among the leading features are articles on the business in futures, on New York as a cotton market, on cotton culture in India and on the consumption of Egyptian and Peruvian cotton in the United States, together with a two-page map showing the area infested by the Mexican boll-weevil on September 30, 1908, compared with the status in 1907, 1906, 1905, 1904 and 1894, respectively. The statistics include a statement of the United States cotton crops and exports and the annual takings of the United States spinners since 1841, the progress of cotton manufacturing since 1808 in Europe, the United States and India, salient features of the supply, consumption and prices of American cotton for each season since 1897, highest and lowest actual prices for middling upland cotton in New York and in Liverpool by months during the past six seasons, and the ginnings of the United States crops of the past four seasons.

The Tryon Hosiery Co.

The Tryon (N. C.) Hosiery Co. will expend \$15,000 to erect the building for its dyeing and finishing plant reported last week. The structure will be two stories high, 50x200 feet, of mill construction, and it will be equipped with machinery (costing \$15,000) for dyeing and finishing 2000 pairs of hosiery daily. Bids for the

machinery are invited. Herbert M. Wilcox is the company's architect and engineer in charge.

Southern Knitting Mills.

An important branch of the textile manufacturing industry of the South is the production of knit goods of various kinds. Plants of the kind manufacture principally hosiery, but many of them are producing various kinds of underwear and other goods for both men and women. While most of the mills are not of large size and capacity, yet there are some with a daily capacity of over 2000 dozen pairs of hose, and those with a daily capacity of 1000 dozen and over are quite numerous. Many of the mills sell their output through local stores and merchants of the South, others finding a market through commission firms in New York and other cities, and considerable capital from the North and East has been invested in these Southern plants. There was an increasing activity noted in establishing new knitting mills and enlarging old plants in the

Brandon Mills Announce an Addition

The first important announcement of the new year in Southern cotton-mill building indicates increasing activity in this direction for 1909. It is contained in the statement that the Brandon Mills of Greenville, S. C., will build an additional plant of 25,000 spindles and 700 looms for the production of print cloth and converters' goods. The company has engaged Messrs. Lockwood, Greene & Co. of Boston, Mass., as engineers in charge, and has let contract for the erection of the building, which will be probably 300x125 feet in size, four stories high. Contracts for the machinery are expected to be awarded during January, and the new mill is to be ready for operation for the next crop of cotton, employing about 200 operatives. This announcement follows the action of the Brandon Mills' directors in voting an increase of capital stock from \$450,000 to \$900,000, as mentioned in the MANUFACTURERS' RECORD of December 24.

Laurinburg's New Yarn Mill.

As reported in December, J. P. McRae of Laurinburg, N. C., will organize a company to build another cotton mill, the equipment to include 15,000 spindles for manufacturing hosiery yarns. He will incorporate a company during January. Mr. McRae is president of the Scotland Cotton Mill and the Dickson Cotton Mill of Laurinburg.

The Trenton Cotton Mills.

Messrs. W. P. Hurt of Fayetteville, Tenn., and J. H. Hurt of Shelby, N. C., have purchased a half-interest in the Trenton Cotton Mills of Trenton, Tenn. The company will be reorganized, and additional machinery will be installed. It now operates 10,500 ring and 4000 twister spindles, producing yarns.

The Lebanon Woolen Mills.

Messrs. H. K. Edgerton, J. J. Askew, H. M. Freeman, S. M. Anderson, G. G. Green and others have incorporated the Lebanon Woolen Mills of Lebanon, Tenn. This company has a capital stock of \$60,000, and will build a woolen mill. Mr. Edgerton was mentioned lately as proposing the enterprise.

Textile Notes.

Brown Cornelson of Oklahoma City, Okla., is interested in a plan to build a cotton mill.

The Bibb Manufacturing Co. of Columbus, Ga., is reported as to install additional machinery. It is now operating 29,056 spindles.

GOING AHEAD.

[Spartanburg (S. C.) Herald.]

We note that on Monday last the County Commissioners of Gaston county, North Carolina, sold \$200,000 worth of bonds at par, the same to be devoted to immediate construction of good roads. They have already used \$100,000 of the \$300,000 authorized some time ago for that purpose, and are now going ahead with the work.

Somehow or other our neighbors over the line don't seem to find any insuperable difficulties about getting together on this kind of a proposition, and they are shoving things ahead with a vim. And Gaston county is but slightly over half as large as Spartanburg county. Its population today is less than half that of our county, being only about 35,000, against fully 80,000 for Spartanburg county. Yet Gaston is going in for \$300,000 worth of good roads.

Our people have not usually been slow to avail themselves of a good thing. Yet they are already behind dozens of counties in our neighboring State. What about it? Respectfully submitted to the patriotism and enterprise of our county.

The Manchester Cotton Mills.

The Manchester (Ga.) Cotton Mills will erect a three-story 104x400-foot building for the plant heretofore reported. A. Francis Walker, 718 Austell Building, Atlanta, Ga., is the engineer in charge, and bids for constructing the building will probably be opened in February. The machinery will include 20,000 spindles and accompanying equipment for the daily production of 15,000 pounds of yarns, and from 400 to 500 operatives will be employed. Fuller E. Callaway of Lagrange, Ga., is chairman of Advisory Board, Manchester Cotton Mills.

Woodberry Mill Resumes Operation.

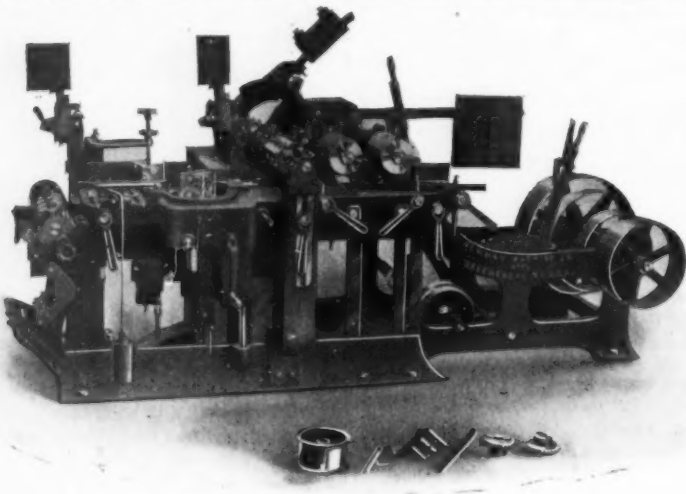
The Consolidated Cotton Duck Co. of Baltimore, Md., has put in operation its Woodberry Mill, which has been idle several months. This plant has an equipment of 35,400 spindles and 280 looms, producing cotton duck, etc.

MECHANICAL

Newman Molding Machine.

A modern machine built in a Southern shop is illustrated herewith. It is a new outside molding machine offered by the Newman Machine Co., Greensboro, N. C. The company's practical man has had years of experience in building woodworking machinery in the North, and knows just what is required in a first-class machine. The molder is heavy and well constructed, adapted to all kinds of work, and built to plane either $9\frac{1}{4}$, $10\frac{1}{4}$, $12\frac{1}{4}$ or $14\frac{1}{4}$ inches wide. The bed will drop 12 inches.

The frame is constructed on a heavy and substantial base, which extends out under table. Outside bearing or column for top head has a verticle adjustment, and is bolted to base, which makes it substantial and rigid. Column at rear end of table, which is in front of under cutter, is bolted to base and locked to table by heavy bolt; bed raises and lowers on a large steel screw mounted on ball bearings by a crank at front of machine; is well gibbed to frame, and ample provision is made for taking up wear; bed directly under top head will be planed to admit of hardwood throat plate, thereby allowing knife to cut to feather edge without coming in contact with table; feed consists of four power-



THE NEWMAN MOLDING MACHINE.

driven rolls, six inches in diameter; feed rolls are strongly geared, which insures a positive and powerful feed; top rolls are weighted and fitted with a lever to raise rolls for removing pattern or molding; bottom rolls can be removed and replaced with fluted rolls without disturbing machine proper; feed has four rates of speed, viz., 16, 24, 32 and 50 feet per minute; feed is stopped and started by means of tightener lever.

The cutterheads are forged from the best grade of steel, slotted on four sides, and each fitted with a pair of straight knives and a complete set of bolts; upper head is mounted on yoked frame, with lateral adjustment; top cutterhead can be removed to permit using a sash head; spindle is large in diameter, has long bearings, and is made of crucible steel; spindle is one and three-quarter inches in diameter where head is applied; under cutter is made from solid steel forging, with bearings two inches in diameter. This head has both vertical and lateral adjustments; it is provided with throat plate in front and in rear of head that can be adjusted to and from knives, as desired; bed in rear of under cutterhead can be dropped down, giving free access to knives without removing guide. This bed has vertical adjustment independent of under cutterhead stock, which enables operator to keep it in perfect line with knives; side spindles are both mounted on table, and have ver-

tical as well as lateral adjustment; they can be set at almost any angle desired while machine is in motion, and can be moved either vertical or lateral without changing degree of spindle; side spindles have long bearings, and are one and three-quarter inches in diameter; spindle is one and one-half inches where head is applied; side heads, as regularly furnished, are four and one-quarter inches long.

The chip-breaker on outside head is weighted; top shoes are all constructed so that they can be thrown back by loosening one nut which has spanner wrenches attached; this gives operator free access to knives. All pressure-bars and chip-breakers are adjustable, and so constructed that they can be moved to clear straight knives two inches; spring posts are held in position with eye bolts, which are supplied with spanner wrenches.

Machine weights are: 9-inch, 5100 pounds; 10-inch, 5200 pounds; 12-inch, 5400 pounds; 14-inch, 5600 pounds; 5 to 8 horse-power; tight and loose pulleys, 12x8 inches; speed, 850 R. P. M.; top head will carry a 7-inch belt, under head a $4\frac{1}{2}$ -inch belt, side heads $3\frac{1}{2}$ -inch belts.

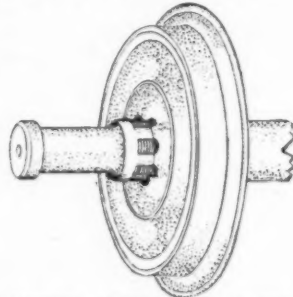
The manufacturer guarantees the machines throughout. The Newman Machine Co. also offers planers and matchers, surfacers, hand planers, double cut-off saws, swing saws, rip saws, resaws, gang edgers,

and casting operations of these car wheels, if as much, than the ordinary type, but the advantageous feature is that they are vastly more safe and reliable.

"It may be urged that this wheel has but half of the bearing surface upon the axle, compared with the present form or method, which is true, and that it consequently has but half the resistance to torsion or twisting on the axle, yet this decreased surface will withstand as great a pressure on axle as the ordinary smooth-bored wheel, so that by an over-pressure the wheel would be split. Then, too, it may also be urged this decreased bearing surface on axle would in a little while 'rim' (ream) the hole by the thrusts or blows on tread and flange by the rail. This theory will not hold good in face of the fact that less than one-half square inch of rail contact upon wheel rim as compared to 20 square inches on wheel seat, the same being only about one-third the bored area for reception of axle.

"The only way that wheels get loose from axle is the fact that they twist, due to curves, and not by the pull of guard rails against the inner face of the flange or 'pull' by rail on wheel tread, due to lateral or swaying motion of car.

"To determine, if possible, which of the two methods of securing car wheels to



LATCHER METHOD OF CASTING WHEELS.

axles was best, a makeshift testing apparatus was constructed for making a test of comparative resistance to torsion of car wheels on axle, one wheel being bored with a smooth round hole and the wheel-seating portion being turned smooth also, about two inches and fifteen-sixteenths of an inch in diameter, being .004 inch larger in diameter than hole in wheel. The other wheel is made with a fluted hole, and bored two inches and fourteen-sixteenths of an inch in diameter; the axle portion which enters the wheel was turned with a V-thread, 15 to the inch, and about one-sixteenth of an inch larger in diameter on the periphery of the thread than the hole in wheel. Both wheels were driven on axle at 28 tons. Test shows that the round hole and smooth axle twisted in its seat when the jack screw lifted the axle not exceeding 1800 pounds (900 pounds on the end of each lever). The fluted wheel remained fixed to axle in this test.

"A pair of car wheels and axle one-sixth full size, with fluted-axle receptacles and made in all respects as full-sized wheels and axle, were fitted up with clamp levers secured to wheels, and power was applied to lever ends while axle was held in proper position. The axle was twisted one-half round by wheels, which did not lose their grip on the axle."

A Successful New Orleans Enterprise.

Illustrating the diversified development in New Orleans, the growth and expansion of the New Orleans Roofing and Metal Works is of interest and significance. The enterprise occupies an entire square, with its factory that has been built "right from the ground up" in something like a dozen years. The main factory building, of steel and concrete, extends for 320 feet along the entire block, with a width of 150 feet,

and there are also several warehouses, boiler-room, etc.

Starting with metal roofing, siding, cornices, etc., the plant has not only greatly extended operations in those lines (until nearly every form of galvanized and black iron, sheet zinc and copper products for building and roofing purposes are made), but a department of tin-can manufacturing has been added that gives the company a leading position in this line. The development of the can factory bears an intimate relationship to the growth of the coffee trade of New Orleans. Creole coffee has been famous for generations, and the assurance that the genuine New Orleans coffee was being obtained gave possibilities for a large extension of trade by New Orleans dealers, and in consequence there have been more than half a dozen houses in the past few years devoting themselves almost exclusively to the roasting and selling in cans of some specific brand of New Orleans coffee.

The New Orleans Roofing and Metal Works has not only kept pace with this development, but has rather fostered and led it. The can factory includes in its equipment a machine that takes a piece of tin in one end and automatically turns out a completed can at the other. This one machine has a capacity of 45,000 cans a day.

In connection with this department there is a lithographic plant for printing labels and colors on the tin sheets. The field of operations of the company is being enlarged all the time, until it has far outgrown the local territory to which it was first confined.

The moving spirit in the enterprise is a New Orleans man—A. S. White. He has been builder as well as creator of the industry, and furnishes an illustration of the industrial possibilities of the people of New Orleans.

Tar Not Injurious to Trees.

Recently the MANUFACTURERS' RECORD published a statement that French officials were proposing to discontinue the use of tar on public roads because they believed that the fine particles thrown up by automobiles were killing trees and shrubbery. At the same time statements were also published showing that tar was not injurious.

One of the finest suburban residential sections in the United States is Roland Park, adjacent to Baltimore. The streets and roads are of macadam, and as Tarvia had been used on them, Richard W. Marchant, Jr., secretary and treasurer of the Roland Park Company, was asked if any injurious effect had been noted on the trees and shrubbery. He states:

"The first use we made of it was on Roland avenue, the central driveway through Roland Park. This driveway receives very heavy traffic from light vehicles, as well as heavy teaming. There is also a great deal of automobilism along the road, and the test to which this material was put on this roadbed was very severe. In the spring of 1907 we applied Tarvia to the west driveway. This roadbed is substantial macadam construction. For six months or more after the Tarvia had been applied the roadbed was practically as smooth as an asphalt pavement. This appearance, however, gradually wore away, and the roadbed now has the appearance of an ordinary macadam road, except along the sides, where there is not a great deal of traffic. This is a condition which we expected, as the asphaltic appearance of the surface of the road to which Tarvia is applied is not supposed to continue unless the Tarvia is applied at more frequent intervals than we have done. Notwithstanding the wearing of the Tarvia from the surface, there are still

lath mills and bolters, lath binders and trimmers, etc.

Latcher Method of Casting Wheels.

A new method or form for casting car wheels has been patented by J. W. Latcher of Edinburg, N. Y. The advantageous feature of the invention is the fluted-core hole for receiving the axle after being bored. The wheel-seating surfaces of axle are to be turned rough or V-threaded somewhat larger in diameter than the bored



LATCHER METHOD OF CASTING WHEELS.

wheels, so that when the wheels are being pressed on axle, channels or grooves will be plowed in such threaded surfaces by wheels, and thus act as keys for securing the wheels rigidly to axle. See two accompanying illustrations. Further describing the method, Mr. Latcher says:

"There is no more cost in the molding

apparent evidences of its good qualities, in that it has taken hold of the macadam and prevents automobiles and other traffic from dislodging the fine material and causing the roadbed to ravel. In our opinion, Tarvia is a good dust layer. It does not, of course, overcome the dust from dirt which is naturally taken onto the roadbed in the course of traffic, or that which is caused by droppings of animals that pass over it, but in preventing as it does the wear of the roadbed by traffic, and the dislodging of the dust which is supposed to bind the larger stones together, it overcomes the dust that is naturally contributed by the wear of the macadam, which is by far the most serious problem on roads of this construction.

"We believe that the best recommendation for Tarvia is its preservative qualities to the roadbed, binding, as we have before stated, the larger stones and preventing the automobiles dislodging from between these stones the small particles of dust which are placed there for the purpose of binding the roadbed together. Those who are familiar with macadam roads know this is an important factor, as it prevents the roadbed from raveling and prevents the road from washing.

"As to any disastrous effects which it may have on trees and shrubbery, we have noted none. The road in question is 120 feet wide, with car tracks in the center and a driveway on either side. The car tracks are separated from each driveway by a row of privet hedge. There is no stone gutter between the roadbed and this hedge, hence the road itself comes up to the hedge, and in applying the Tarvia it was naturally applied very close to the planting. On either side of the road, between the sidewalk and the stone gutter, there are shade trees. We have not noted that the hedges or the trees have been damaged in the slightest by the use of Tarvia.

"The only other experience which we have had with this material was on Elmwood road. This is a road which does not receive much traffic. The grade of this road being steep, Tarvia was applied for the purpose of preserving it against washing. In this respect we have found it all that we could ask.

"Our conclusions, therefore, are Tarvia is a good dust layer; it does not damage planting along the roadbed on which it is applied, and that its most desirable feature is that it protects, as nothing else does which we have tried, the roadbed from wear on account of traffic, rainfall, and particularly the serious damage which automobiles do to macadam roads."

Champion Fiber Co.'s Conveying Equipment.

The conveying equipment is an important factor in the efficient and economical operation of many industrial plants. It is, therefore, of interest to present the two accompanying views of the modern conveying system and style of conveyor installed for the Champion Fiber Co. at Canton, N. C. The system handles chips, refuse, black ash, etc., the total length exceeding 3700 feet. The view of the system includes the company's mills, the long-housed structure in the foreground containing a belt conveyor for sawdust, shavings, etc. The system was furnished by the Link-Belt Company, Nicetown, Philadelphia, Pa. It comprises the following:

Roller flight "Monobar" chain conveyors—two strands of "Monobar" chain with steel flights, and is fitted with chambered self-oiling rollers; carrying and return runs supported, respectively, on flat-iron and angle-iron tracks; 13 of these conveyors, totaling 2073 feet, require about 9000 feet of chain in size known as No. 618. Simplicity governs the chain's construction. Wrought-iron T-head bolts are con-

nected in series of malleable-iron sockets, in which the knuckles holding the opposite ends of the adjacent bolts are free to turn.

The combination of a flexible joint and rigid, single bar (Monobar) marked an advance in chain construction cotemporary with modern conveyor practice in which it has steadily maintained a record for efficiency. But two other types—the Ewart detachable link-belt and the Dodge chain—have been as extensively used.

For the requirements of the Canton plant the "Monobar" was found to be particularly suited. It has no welds, which

rolls, spaced 10 feet apart. The average speed of each conveyor is 318 feet per minute; the hourly capacity, 130,000 pounds.

In detail the new troughing roll is made up of a straight middle section flanged into the edges of the bell-shaped end sections snugly, giving an even, one-piece, shallow-trough surface. Each bell-shaped end is closed by a permanent disc flanged into the flare. The general design shows how freedom from defective operation is secured. The clear height above the supporting plank removes all tendency to obstruction from a deposit of material, the

these to the screens. The hemlock and spruce refuse—sawdust and shavings—is deposited upon belt conveyors Nos. 4 and 5, and transferred from these to the housed belt conveyor No. 11, which runs along the outside of the buildings for 520 feet. The discharge end of this conveyor is arranged so that the screenings may be delivered either into storage bins or onto "Monobar" conveyor No. 12, as desired; if to the conveyor, they are carried direct to boiler-house and used as fuel; if to storage bins, they are ultimately put through regrinders, reduced almost to a



CHAMPION FIBER CO.'S CONVEYING EQUIPMENT.

eliminates the most vulnerable point in wrought-chain construction; lightness results from fewness of joints, and added to its durability is the distinctive feature of wide bearing surface, with the joints easily accessible to lubrication.

The bolts are thus relieved from wear and are additionally satisfactory because their roundness prevents clinging or lodging of material.

At the average speed—100 feet per minute—the hourly capacity of each conveyor is 150,000 pounds of chips, etc., the shortest conveyor being 70 feet between centers, the longest 322 feet. Each is pro-

vided with the Link-Belt patented equalizing gears, which reduce wear and save driving power by transforming the inherent jerky motion of a long pitch chain into smooth and regular movement.

Six belt conveyors, ranging in length from 42 feet to 520 feet, make up 1137 feet of the system. They consist of 30-inch belts traveling, on the carrying run, over the new pressed-steel troughing rolls introduced by the Link-Belt Company. These rolls are spaced five feet apart and fixed rigidly to through-shafts which revolve in chain-oiling, dust-tight bearings; the return run is over straight-face idler

shaft arrangement referred to insures that each roll will revolve, and the closed ends are an effective barrier against entrance of material—a further guarantee that the roll cannot be clogged or thrown out of balance.

Five bucket elevators, with a total length of 181 feet, complete the chip-handling machinery. All are of the centrifugal discharge type, being constructed of steel buckets bolted at intervals of 15 inches to a 24-inch wide belt. Each is complete with boot, takeup, etc., and is enclosed in a steel casting fitted on the inner sides, with wrought steel wearing

powder, delivered to "Monobar" conveyors Nos. 16 and 17, and distributed into leaching tanks. From these tanks the refuse is dropped onto "Monobar" conveyors Nos. 18 and 19, transferred to short-belt conveyor No. 15, then to belt conveyor No. 14, and lastly to "Monobar" conveyor No. 12, which finally delivers it to boiler-house.

The clean chips, upon coming from the screens, are transferred successively to belt conveyors Nos. 6, 7 and 8, the last delivering them to belt bucket elevator No. 9; this elevator discharges them onto "Monobar" conveyor No. 10, which delivers them to storage bin, and from this, by means of bottom gates, they are fed to the digester.

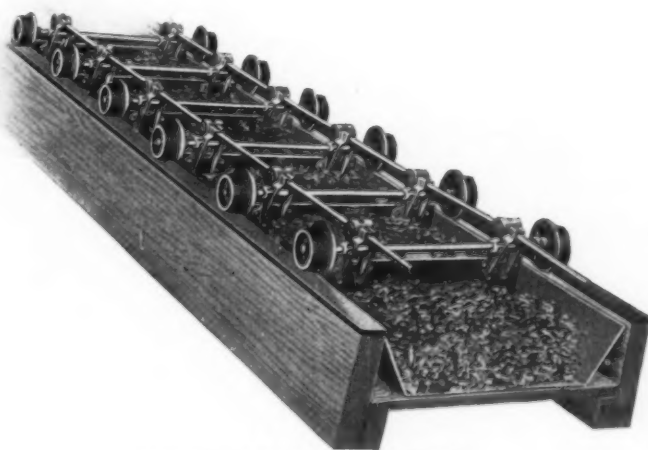
The arrangement of conveyors for handling black ash is: No. 26, a drag chain conveyor, 74 feet centers, composed of No. 11-10½ link-belt running in a concrete trough, receives the ash from the kilns and transfers it to inclined conveyors Nos. 27 and 28, each made up of overlapping steel pans attached to a single strand of No. 730 chain fitted with enclosed oiling rollers which run on angle-iron tracks. These machines are 57 feet center to center, and discharge into drag chain conveyors Nos. 29 and 30, also of 57 feet centers and similar in construction to conveyor No. 26, for delivery to leaching tanks.

The description was furnished by Frederic V. Hetzel, chief engineer of the Link-Belt Company. George F. Hardy of New York city was the engineer and architect.

To Develop 5000 Horse-Power.

The Granite Manufacturing Co., C. H. Alexander, president, Dallas, Texas, has completed arrangements for building its proposed water-power-electrical plant at Marble Falls, Texas. It will construct a steel and concrete dam 16 feet high and 1300 feet long across the Colorado River, giving a fall of 40 feet and the development to give 60 feet, to generate over 5000 horse-power for transmission by electricity to lighting and manufacturing plants. The estimated cost of the development is \$250,000.

The assessed value of property in Oklahoma is \$728,507,373.



CONVEYORS AT CHAMPION PLANT.

vided with the Link-Belt patented equalizing gears, which reduce wear and save driving power by transforming the inherent jerky motion of a long pitch chain into smooth and regular movement.

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strips to prevent the ends and fronts of buckets from coming in contact with the casing proper. Three of these elevators are 27 feet long between centers, and each can deliver 130,000 pounds per hour at an average speed of 250 feet per minute; the fourth, of 22½ feet centers, can deliver 130,000 pounds per hour at 274 feet per minute, and the fifth, with 81 feet centers, can deliver 175,000 pounds per hour at 400 feet per minute.

The general layout of the system operates as follows: Upon coming from the barkers and chippers the chips are delivered to elevators Nos. 1, 2 and 3, and by

Construction Department

TO OUR READERS!

In order to understand and follow up properly the Construction Department items, please bear in mind the following statements:

EXPLANATORY

The MANUFACTURERS' RECORD seems to verify every item reported in its Construction Department by a full investigation and complete correspondence with everyone interested. But it is often impossible to do this before the item must be printed, or else lose its value as news. In such cases the statements are always made as "rumored" or "reported," and not as positive items of news. If our readers will note these points they will see the necessity of the discrimination, and they will avoid accepting as a certainty matters that we explicitly state are "reports" or "rumors" only. We are always glad to have our attention called to any errors that may occur.

In correspondence relating to matters reported in this paper, it will be of advantage to all concerned if it is stated that the information was gained from the MANUFACTURERS' RECORD.

ADDRESS FULLY

To insure prompt delivery of communications about items reported in these columns, the name of one or more incorporators of a newly incorporated enterprise should be shown on the letter addressed to that town, or to the town of the individual sought, as may be shown in the item, as sometimes a communication merely addressed in the corporate or official name of a newly established company or enterprise cannot be delivered by the postmaster. This will help to insure prompt delivery of your communication, although it is inevitable that some failures on the part of the postal authorities to deliver mail to new concerns will occur.

WRITE DIRECT

It is suggested to advertisers and readers that in communicating with individuals and firms reported in these columns, a letter written specifically about the matter reported is likely to receive quicker and surer attention than a mere circular.

BRIDGES, CULVERTS, VIADUCTS

Beaufort, N. C.—Bids will be opened January 30 for construction of steel draw-span highway bridge, with pile and concrete foundations, on Core Creek, near Beaufort; Earl I. Brown, Captain, Engineers, U. S. Engineer office, Wilmington, N. C. (See "Machinery Wanted.")

Isola, Miss.—Washington county will construct steel bridge about 150 feet long across Jackson Bayou near Isola; bids opened January 4; W. W. Miller, clerk, Greenville, Miss.

Lawton, Okla.—Comanche county will construct steel bridge; 100-foot steel span; 14-foot roadway; 24-foot steel tubes; three 14-foot, three 12-foot and six 8-foot steel piles; bids opened January 5; J. M. Haynes, County Clerk.

Memphis, Tenn.—Gardiner & Howe (probably of Memphis) are lowest bidders at \$3485 for construction of iron and concrete bridge over Southern Railway tracks on Monroe avenue; Heiskell Weatherford, City Engineer. (Recently mentioned.)

Miami, Fla.—Florida East Coast Ry. Co. will construct three bridges in connection with operations below Knights Key; concrete substructure and steel superstructure; at Knights Key, 680 feet, at Moser Channel, 700 feet, and at Bahia Honda, 400 feet; construction by company's labor; J. C. Meredith, constructing engineer.

Mount Olive, Miss.—Houston & Cunningham, 706 Maison Blanche, New Orleans, La., have been retained as consulting engineers and will prepare plans for electric-light plant at Mount Olive, to cost \$7000. Bids will be called for in about 60 days.

Newkirk, Okla.—Missouri Valley Bridge Co., Leavenworth, Kans., has contract at \$21,550 for construction of steel bridge over Arkansas River at Newkirk for Kay county.

Paris, Ark.—Logan County will construct steel and iron bridges over Sugar Creek, Petit Jean at Lucas Ford, Scott Creek, Cane Creek, Mill Creek and Little Shoal Creek; contract to be let March 4; J. W. Castleberry, County Judge; Fred N. Carter, County Clerk. (See "Machinery Wanted.")

Prestonsburg, Ky.—Chesapeake & Ohio Ry., F. I. Cabell, engineer maintenance of way, Richmond, Va., will, it is reported, construct bridge across river at Prestonsburg.

San Antonio, Texas.—Guy Borden, assistant engineer, is preparing plans for viaduct across Alazan Creek, which will serve as feeder for proposed sewer system in Prospect Hill Improvement District. (See "Sewer Construction.")

CANNING AND PACKING PLANTS

El Paso, Texas.—J. H. Nation will establish packing plant, to cost \$100,000.

Green Forest, Ark.—Green Forest Canning Co. will be reorganized with \$30,000 capital stock by C. L. Scott, who has purchased interest; proposed to increase capacity.

Laurel, Miss.—Cudahy Packing Co., Chicago, Ill., will, it is reported, establish distributing warehouse in Laurel and erect cold-storage vaults.

Savannah, Ga.—Company will be incorporated with \$15,000 capital stock by J. T. Shuptrine, Gordon Saussy, J. F. Tietjen and others to establish cannery with capacity of 20,000 cans daily; building will be erected to cover about one acre of ground; cost \$15,000; contract for erection awarded to Chicago Building & Manufacturing Co., Chicago, Ill.

Springfield, Mo.—Teagarden Packing Co., recently noted to expend \$25,000 for improvements, has increased capital stock from \$75,000 to \$100,000.

CLAYWORKING PLANTS

Brunswick, Mo.—Brick and Tile.—Brunswick Brick & Tile Co. has increased capital stock from \$20,000 to \$30,000.

Gadsden, Ala.—Earthenware Stove Flue.—Henry Collins, Hokes Bluff, Ala., contemplates, it is reported, establishment of plant in Gadsden for manufacturing patented earthenware stove flue.

Newport News, Va.—Putty.—T. Nedeau, Boston, Mass., proposes establishment of plant in Newport News for manufacturing putty from clay by patent process.

Queenstown, P. O. Birmingham, Ala.—Bricks and Tiling.—The Queenstown Company, 213 First Ave., Birmingham, reports that plant for manufacturing bricks and tiling will be located within 30 days.

Walnut Cove, N. C.—Bricks.—Hedgecock Brickyard Co., Winston-Salem, N. C., will make improvements to plant at Walnut Cove, including installation of new drying plant. After improvements are made plant will make and load 6,000,000 bricks daily.

COAL MINES AND COKE OVENS

Charleston, W. Va.—Little Coal Land Co. incorporated with \$225,000 capital stock by J. A. Holley, Sampel Stephenson, L. Carr, all of Charleston; S. M. Croft and C. S. Croft, both of Madison, W. Va.

Chattanooga, Tenn.—American Coal Land Co. incorporated with \$120,000 capital stock by S. E. Harte, J. D. Goode, Samuel L. Boddy and others.

Chattanooga, Tenn.—State of Tennessee, previously stated to develop Herbert Domain (11,000 acres of coal lands), will, it is reported, begin prospect work early in spring under direction of Gov. M. R. Patterson, Nashville, Tenn.

Clarksburg, W. Va.—Isaac Lemans and James Husted, Uniontown, Pa., have, it is reported, purchased for development 425 acres of coal lands near Clarksburg for about \$42,500.

Coal Hill, Ark.—W. H. West Coal Co. incorporated with \$75,000 capital stock by W. H. West, L. E. West and H. T. Hackney.

Howe, Okla.—Lincoln-Kleeman Coal Co. incorporated with \$10,000 capital stock; Charles H. Kleeman, president; James A. Lincoln, vice-president; Frederick A. Kleeman, secretary-treasurer.

Williamsburg, Ky.—Diamond Coal Co. incorporated with \$10,000 capital stock by W. R. Ballou, Dr. E. Foley and G. H. Moses.

CONCRETE AND CEMENT PLANTS

Demopolis, Ala.—James S. Pinckard and Massey Wilson, both of Montgomery, Ala., have purchased (for \$300,000) Alabama Portland Cement Co. and plant, 40 acres of cement land, etc.; will organize new company and expend \$200,000 for additional machinery and various improvements, increasing present capacity of 500 barrels per day to 1000

barrels. Cook & Laurie of Montgomery, who will be interested in new company, have contract to overhaul all machinery and double output.

COTTON COMPRESSES AND GINS

Clayton, Ala.—W. H. & S. A. Nix will rebuild cotton gin recently reported burned; will erect fireproof building 22x60 feet, to cost from \$500 to \$800; will purchase and install a 70-saw gin plant; have engine and roller; date of opening machinery proposals not set. Address W. A. Nix, Box 127, Clayton. (See "Machinery Wanted.")

ELECTRIC-LIGHT AND POWER PLANTS

Barboursville, W. Va.—United Utilities Co., L. L. Dowthatt, manager, is planning, it is reported, to construct electric, water and steam-heating plant combined; equipment to include one 25-kilowatt 225-volt direct-current generating unit; 50-gallon-per-minute turbine pump; two 150-horse-power boilers to operate at 125 pounds; three-panel switchboard for 220-volt generators to operate in parallel on six 50-lamp light and power circuits, etc.

Bryan, Texas.—City is considering arrangements to secure better light system; J. T. Maloney, Mayor. (See "Water-works.")

Cambridge, Md.—Cambridge Light & Power Co. incorporated by R. B. Fentress of Norfolk, Va.; Phillips L. Goldsborough of Cambridge, Collector of Internal Revenue, Custom-house, Baltimore, Md., and others. Mr. Fentress and associates have purchased site and awarded contracts for erection of building for electric-light plant, to be completed within 60 days; franchise secured.

Cornersville, Tenn.—Lewisburg Light & Power Co., S. T. Hardison, president, Lewisburg, Tenn., contemplates transmitting electricity from its plant at Lewisburg to light Cornersville.

Danville, Ark.—Danville Electric Light Co. incorporated with \$100,000 capital stock; D. F. Montgomery, president; J. B. Grayton, vice-president; George Leming, secretary; A. M. Falls, treasurer.

Eldorado, Ark.—Eldorado Light & Water Co. incorporated with \$50,000 capital stock; John Holmes, president; J. J. Hudson, vice-president; S. R. Morgan, secretary-treasurer.

Greensboro, N. C.—Randolph Power Co. incorporated with \$100,000 capital stock by W. C. Petty, H. C. Petty and M. W. Parrish.

Lexington, Ky.—Midland Electric Co., recently reported incorporated with \$100,000 capital stock by Pendleton Beckley, Louisville, Ky., and others, purchased site on which to erect buildings to be equipped with machinery for furnishing electric lights.

Marble Falls, Texas.—Granite Manufacturing Co., C. M. Alexander, president, Dallas, Texas, will build water-power electric plant reported last month; dam to be of steel and concrete, 16 feet high, 1300 feet long; present development to provide 40-foot fall and final

Sulphur, Okla.—Sulphur Light Co. incorporated with \$36,000 capital stock by C. L. Patterson, Mangum, Okla.; E. E. Preston, Oklahoma City, Okla.; J. F. McKeel, Ada, Okla.

development 60 feet; to generate over 5300 horse-power; cost of initial plant estimated at \$250,000.

Sarasota, Fla.—H. P. Porter will construct electric-lighting system.

Walland, Tenn.—Schlosser Leather Co., recently noted to change motive power from steam to electricity, awarded contract for concrete dam, race, penstocks, etc., to Eastern Construction Co., Knoxville, Tenn.; for turbine wheels to S. Morgan Smith & Co., York, Pa., and electrical equipment to General Electric Co., Schenectady, N. Y.; company is damming Little River, near Walland, and will develop 160 horse-power; cost of plant about \$15,000.

FLOUR, FEED AND MEAL MILLS

Bixley, N. C.—J. C. Smith will build roller flour mill; machinery not yet purchased. (See "Machinery Wanted.")

Durant, Okla.—D. Head & Son contemplate erection of meal mill and warehouse; buildings to be of concrete, 60x80 feet; equipment will include electric motor and meal mill; estimated cost, \$6000; will be constructed by day labor; owner will purchase all machin-

ery and material; W. A. Stevens of Durant is architect.

Evington, Va.—Flour.—C. W. Mann contemplates rebuilding flour mill recently reported burned; time not decided; when building is erected will install machinery for flour mill of 30 to 40 barrels daily capacity; will also place sawmill equipment. (See "Machinery Wanted.")

Evington, Va.—C. W. Mann contemplates rebuilding Flat Creek Grist Mill, recently reported burned at loss of \$3000.

Hagerstown, Md.—Flour.—D. A. Stickle, recently noted to install new equipment, increasing capacity to 260 barrels of flour daily, has placed order for machinery with Nordyke & Marmion Company, Indianapolis, Ind.

Nashville, Tenn.—Nashville Roller Mills incorporated with \$25,000 capital stock by V. S. Tupper, Bruce P. Shepherd, John Coode and others.

St. Louis, Mo.—Hunter-Robinson-Wenz Milling Co. incorporated with \$25,000 capital stock by Allan H. Clark, Edward O. Hunter, Alymer C. Robinson and Charles A. Wenz.

FOUNDRY AND MACHINE PLANTS

Birmingham, Ala.—Castings.—A. O. Kehm Casting Co., 25th St. and Twenty-eighth Ave., will equip foundry at North Birmingham recently reported; will erect building 62x90 feet, 36 feet high, at cost of \$1500; cost of equipment, \$10,000; will manufacture heavy blast-furnace and mine castings; daily capacity, 40 tons heavy castings; plans for building by A. O. Kehm.

Hattiesburg, Miss.—Sawmill Machinery.—Wheland Machine Works, Chattanooga, Tenn., has, it is reported, secured warehouse and foundry and will install \$40,000 worth of machinery for manufacture of sawmill machinery.

Kansas City, Mo.—Safety Rail Joint Lock. Mason Safety Rail Joint Lock Co. incorporated with \$100,000 capital stock by Ben H. Barr, Smith Baker, Howard L. Mason and others.

Oklahoma City, Okla.—Incinerators.—Conley Incinerator & Manufacturing Co., Leavenworth, Kans., will establish plant in Oklahoma City for manufacturing incinerator plants; offices will be in Indiana Building, North Robinson street.

Queenstown, P. O. Birmingham, Ala.—Stoves.—The Queenstown Company, 213 First Ave., Birmingham, reports a stove foundry will be located within 30 days.

Richmond, Va.—Structural Steel and Ornamental Iron.—Richmond Pattern and Structural Iron Works, C. M. Liphart, president, will enlarge structural branch, as recently reported; newly-leased building is 80x200 feet; fabricating structural steel machinery has been ordered; present plant to be used exclusively for making of ornamental iron; tonnage will be doubled; company has no present intention of building.

Rossville, Ga.—Cotton Gins.—Fuller Combining Gin Co., Charlotte, N. C., James T. Fuller, president, awarded contract to Hale & Biting, Chattanooga, Tenn., for erection of one of company's factory buildings; two stories; 60x200 feet; reinforced concrete walls and roof; concrete floor; no wood to be used except in door and window frames; fireproof; electric lights; machinery to be operated by electricity; building (previously mentioned) to cost \$30,000. (See "Machinery Wanted.")

Tulsa, Okla.—Iron Works.—Oklahoma Iron Works contemplates, it is reported, enlarging plant.

GAS AND OIL DEVELOPMENTS

Grafton, W. Va.—A. Hood Phillips and P. H. McGrady have, it is reported, leased about 2500 acres of gas lands; will organize company to sink test wells.

Muskogee, Okla.—Prairie Oil & Gas Co., main office Independence, Kans., is understood to have filed survey maps of its proposed 12-inch pipe line for conveying oil from Oklahoma fields to New Orleans, a distance of 519 miles; construction through Oklahoma, Arkansas and Louisiana to the Gulf; plans to be approved by Secretary of Interior before construction can begin. This project was previously reported and recently referred to in connection with report that Standard Oil Co., main office 26 Broadway, New York, is completing arrangements for pipe line from Caddo fields of Louisiana to New Orleans, a distance of 306 miles, as continuation of Prairie company's line. Standard

Oil Co. is known to plan building large refinery at New Orleans.

New Orleans, La.—Robert F. Broussard, New Iberia, La.; B. G. Dawes, Marietta, Ohio, and associates are promoting construction of natural-gas pipe line from Shreveport to New Orleans.

Sutherland Springs, Texas.—Sutherland Springs Oil & Gas Co. incorporated with \$12,000 capital stock by T. C. Worthington, Nat M. Washer, J. B. Dibrell, all of San Antonio, Texas, and others; to develop oil deposits on 200 acres of land.

Tulsa, Okla.—Lucas Oil Co. incorporated with \$5000 capital stock by F. B. Ufer, P. J. White and R. W. Kellough.

Tulsa, Okla.—Elk County Oil & Gas Co. incorporated with \$25,000 capital stock by Geo. B. Harmon, Milton J. Maxwell, both of Tulsa; W. P. Murphy and J. K. Gardner, both of Ridgeway, Pa.

ICE AND COLD-STORAGE PLANTS

Gainesville, Texas.—Rolling Mill.—Organization of company with \$50,000 capital stock to establish rolling mill is contemplated. Address Sam J. Helm, secretary Commercial Club.

Laurel, Miss.—Cudaby Packing Co., Chicago, Ill., will, it is reported, erect cold-storage vaults in Laurel. (See "Canning and Packing Plants.")

Macon, Ga.—Central City Ice Works incorporated with \$123,000 capital stock, and privilege of increasing to \$300,000, by A. Block, Edward Wolff, Morris Harris and others.

Memphis, Tenn.—Structural Steel and Iron. Memphis Steel Construction Co., recently reported incorporated with \$100,000 capital stock by George R. James, W. A. Hein and others, has purchased Odlum-Taylor Boiler Works and will remodel for manufacture of structural steel and iron; reported that new buildings will be erected. C. J. Rofely is chief engineer. (Recently mentioned.)

Meridian, Miss.—Armour & Co., main office Chicago, Ill., will establish, it is reported, ice plant in Meridian with capacity of between 25 and 40 tons daily.

Nashville, Tenn.—Independent Ice Co., recently reported incorporated and to establish factory at cost of \$10,000, will erect brick structure 100x100 feet; composition roof; capacity of plant, 60 tons; F. A. Alley, president; J. C. Allen, vice-president; J. A. Green, secretary and treasurer. (See "Machinery Wanted.")

LUMBER-MANUFACTURING PLANTS

Anderson, S. C.—Brissey Lumber Co. will be incorporated with \$50,000 capital stock; L. Brissey, president and treasurer; to continue established plant. (Recently mentioned.)

Antlers, Okla.—Gray Lumber Co., Cleveland, Ohio, will, it is reported, establish 150,000 capacity sawmill at Antlers; also proposed to construct railroad between Little River timber district and Antlers, for hauling logs.

Ashley, Miss.—J. W. Ashley will rebuild sawmill recently reported burned; will erect \$5000 fireproof building; proposals for machinery to be opened February 1; capacity of plant, 15,000 feet lumber daily.

Austin, Texas.—Grande Lumber Co. has increased capital stock from \$10,000 to \$50,000.

Birmingham, Ala.—Adams-Gunnels Lumber Co. incorporated with \$10,000 capital stock; J. M. Adams, president; James N. Gunnels, vice-president; John N. Gunnels, secretary-treasurer.

Brewton, Ala.—Lovelace Lumber Co. will, it is reported, rebuild sawmill and basket factory reported destroyed by fire; loss about \$75,000.

Eufaula, Ala.—J. E. Methvin contemplates, it is reported, establishment of sawmill.

Evington, Va.—C. W. Mann contemplates installing sawmill machinery. (See "Flour, Feed and Meal Mills" and "Machinery Wanted.")

Fordyce, La.—Sturgeon Lumber Co. is, it is reported, preparing to establish another circular-saw mill on Dorcheat Bayou.

Glamorgan, Va.—Stonegap Ceiling Co. is not preparing to install portable mills; this corrects recent report.

Gorman, W. Va.—Warren C. White, Cumberland, Md., has, it is reported, purchased tract of timber near Gorman and will establish sawmill.

Jacksonville, N. C.—Suffolk Lumber Co. incorporated with \$100,000 capital stock by J. M. Wiggins, G. L. Wiggins and J. C. Wiggins, all of Suffolk, Va.

Kentucky.—George V. Turner, Pineville,

Ky., has, it is reported, purchased 90,000 acres of timber land in Clay and Harlan counties, and will probably develop same.

Kentucky.—L. W. Fields, Whitesburg, Ky., and associates are purchasing timber recently reported; plans to be announced later.

Lynchburg, Va.—Dunnington Lumber Co. incorporated with \$25,000 capital stock; F. M. Dunnington, president and treasurer; W. M. Dalney, secretary.

Lynchburg, Va.—Dunington Lumber Co. incorporated with \$25,000 capital stock; F. M. Dunnington, president and treasurer; W. M. Dalney, secretary.

Morgantown, W. Va.—E. B. Gribble, Brownsville, Pa., has, it is reported, purchased and will develop about 150 acres of timber land containing 800,000 feet of lumber.

Murphy, N. C.—The Woodworking Company incorporated with \$10,000 capital stock; A. G. Dewese, president; S. W. Lovingood, secretary and general manager; will operate plant with capacity of about 3000 feet daily; makes specialty of house construction materials; machinery purchased.

Nadawah, Ala.—Pine Forest Lumber Co., recently reported incorporated with \$100,000 capital stock, purchased and will operate plant of Shoal Creek Lumber Co.; daily capacity of mill, 75,000 feet; J. H. Fuller, president.

Norfolk, Va.—Baker-Minter Lumber Co. incorporated with \$100,000 capital stock; H. E. Baker, president; D. M. Pratt, treasurer; both of Elmira, N. Y.; S. F. Minter, vice-president, New York; company not yet ready to announce plans. (Recently noted under Delaware, Va.)

Snyder, Ark.—Pohlmeier Lumber Co., W. E. Farrell, president, recently reported incorporated, will erect \$750 building, 100x30 feet, and install sawmill and planing-mill machinery to cost \$3000; machinery purchased; daily capacity of plant 15,000 feet.

Sparta, Tenn.—William Lyles Lumber Co. will rebuild planing mill, etc., at East Sparta, recently reported burned; building 56x100 feet. (See "Machinery Wanted.")

Sutherland, Va.—Powell's Valley Lumber Co. will, it is reported, install large mills on headwaters of Powell's River, making a specialty of oak and poplar; five-mile lumber road will be constructed.

Tampa, Fla.—Dekle Investment Co., Lee Dekle, president, has acquired about 14,000 acres yellow pine near Tampa and will erect saw and planing mill with daily capacity of 25,000 feet; will install machinery, lay rails for logging, etc. (See "Machinery Wanted.")

Tompkinsville, Ky.—Haynie & Shannon will establish planing mill; contract for installation of machinery awarded to W. F. Jenkins, Tompkinsville; building construction has begun.

Valley View, Ky.—J. D. Hughes Lumber Co. will establish another large mill.

MINING

Birmingham, Ala.—Iron.—Standard Fuel & Iron Co. incorporated with \$10,000 capital stock; H. J. Falls, president; R. C. Henderson, vice-president and treasurer; James L. Davidson, secretary.

Charleston, W. Va.—Stone.—Capital Stone Co. incorporated with \$25,000 capital stock by G. T. Thayer, Geo. S. Couch, J. D. Baines and others.

Marcella, Ark.—Gold.—Company incorporated with \$300,000 capital stock by C. H. Graham, Charles Seeberger, J. H. Vibber and William G. Horton to develop gold deposits in Ozark Mountains, in Stone and Marion counties; first mine to be opened will be in Stone county near Marcella; about \$200,000 worth of machinery reported to be installed.

Statesville, N. C.—Asbestos.—Charles Lambert, Pittsburg, Pa., has, it is reported, purchased 50 acres of land near Statesville, containing asbestos deposits, and will develop.

St. Louis, Mo.—Lead and Zinc.—Missouri Mining & Pipe Co. incorporated with \$10,000 capital stock by John B. Denvir, John K. Jones, Frank Noble and others.

Norfolk, Va.—Dredging.—Maryland Dredging & Contracting Co., Frank A. Furst, president, 804-806 Fidelity Bldg., Baltimore, Md., has contract for dredging 1,600,000 yards of channel from Lambert's Point to Norfolk.

Yadkinville, N. C.—Piedmont Mining & Development Co. incorporated with \$250,000 capital stock by Luther H. Dixon, Cana, N. C.; H. E. Frederickson, C. A. Hamilton, both of Omaha, Neb., and others.

MISCELLANEOUS CONSTRUCTION WORK

Baltimore, Md.—Pier.—Atlantic Transport Co., James C. Gorman, resident manager, will

rebuild Canton pier and warehouse, recently burned; new pier probably 700 feet long; warehouse of corrugated iron. General offices, 201-207 Chamber of Commerce Bldg.

Bandera County, Texas.—Irrigation.—A. M. Arthur, Jennings, La., is contemplating installation in about a year of small plant for irrigation of alfalfa lands; will previously build house for foreman, construct fencing, etc.; total cost from \$5000 to \$7000.

Alexandria, La.—Levee.—Board of Commissioners Red River, Atchafalaya and Bayou Boeuf Levee districts will construct new levee in Rapides parish, to be known as B. T. Lewis Levee; to contain about 33,000 cubic yards of earthwork; bids to be opened January 15 at office of Board in Alexandria.

El Reno, Okla.—Canal.—St. Louis, El Reno & Western Railway, Fort Smith & Western Railway (W. M. Bushnell, Fort Smith, Ark., general manager of both companies) and Chicago, Rock Island & Pacific Railway (J. B. Berry, Chicago, Ill., chief engineer) are considering arrangements, it is reported, for preventing flooding of property by waters of Four-Mile Creek; proposed to construct canal northward along St. Louis, El Reno & Western Railway tracks to old creek bed, which will carry waters to river. This company also agreed to construct bridge on its line west of county farm. City Council has passed ordinance authorizing moving of 600 feet of sewer a short distance, necessitated by construction of canal.

Houston, Texas.—Channel.—City is considering construction of 25-foot channel down Buffalo Bayou from Federal turning basin to the Gulf. It is estimated that work can be completed within 19 months and will cost \$2,000,000; bond issue for this amount is proposed. T. C. Tarver is City Engineer.

Millikin, La.—Irrigation Plant.—Jan. 8. Millikin will install pumping plant with capacity for watering 1000 acres; proposals for machinery to be opened May 1, 1909.

New Iberia, La.—Drainage.—Henry N. Pharr, Olivier, La., is promoting organization of drainage district to embrace all lands contiguous to and draining into Petit Bayou. V. P. Guilfoix, civil engineer, of New Iberia is in charge of preliminary survey and will estimate cost of construction.

MISCELLANEOUS ENTERPRISES

Alvin, Texas.—Steam Laundry.—H. Russell will establish steam laundry.

Atlanta, Ga.—Printing Plant.—Interstate Printing Co. will soon call for bids on four-story or six-story printing-plant building. (See "Interstate Holdings Co., Atlanta.")

Atlanta, Ga.—Printing, Publishing, etc.—Interstate Holdings Co., Rolfe Hunt, president, recently noted incorporated with \$100,000 capital stock, controls following organizations and corporations, all of which are operated under separate charters: Congregational Methodist Publishing House, Interstate Printing Co., the Dixie Company, Interstate College, all of Atlanta, and Times Printing Co., Thomaston, Ga.; also has management of Atlanta Bible School, Atlanta; contemplates erection within a year or two of 10-story office building, to be located in Atlanta.

Ayden, N. C.—Merchandise.—E. Turnage & Co. incorporated with \$25,000 capital stock by Elias, J. R. and E. L. Turnage.

Augusta, Ga.—Shoes, etc.—Florsheim Shoe Store Co. incorporated with authorized capital stock of \$25,000 by Joseph R. Bernstein, Augusta; Felix Florsheim, Milton S. Florsheim, both of Chicago, Ill., and others.

Birmingham, Ala.—Furniture.—W. H. Ferris Furniture Co. incorporated with \$5000 capital stock; K. C. Ferris, president; F. H. Hanford, vice-president and secretary; W. H. Ferris, treasurer and manager.

Birmingham, Ala.—Paints.—Greater Birmingham Paint Supply Co. incorporated with \$25,000 capital stock; William Spencer, president; A. H. Rogers, secretary and treasurer, Edward Hentschel, general manager.

Bloomfield, Mo.—Hardware.—Reddick Hardware Co. incorporated with \$5000 capital stock by C. F. Reddick, Carl Weber and R. S. Houck.

Chattanooga, Tenn.—Land Development.—New Era Land Co. incorporated with \$10,000 capital stock; D. W. Hughes, president; W. N. Hudburg, manager; company has purchased tract of land in Alton Park, which it will divide into lots and place on market; streets and alleys will be laid off; contract for this work awarded to Cushman & Farleigh, Chattanooga.

Dallas, Texas.—Fire Extinguishers.—General Fire Extinguisher Co. of Texas incorporated with \$25,000 capital stock by W. H. McGrath, M. L. Crawford, both of Dallas, and George C. Comstock, New York.

Fort Worth, Texas.—Publishing.—Fort Worth Publishing Co. incorporated with \$125,000 capital stock by Paul Waples, Sam Davidson, W. G. Newby and others; consolidation of Fort Worth Telegram and Fort Worth Star.

Payetteville, Ark.—Steam Laundry.—Citizens' Laundry has increased capital stock from \$5000 to \$7500.

Geary, Okla.—Hardware.—Moore-Hollister Hardware Co. incorporated with \$10,000 capital stock by J. W. Moore, Geary; Wren Moore, Calumet, Okla., and Sarah Hollister, Addington, Okla.

Hamlet, N. C.—Merchandise.—Pillow & Co. incorporated with \$15,000 capital stock by G. W. Pillow, O. T. Goodwin and J. C. Neemyer.

Hendersonville, N. C.—Groceries.—Calhoun-Wilkins Company incorporated with \$15,000 capital stock by W. Calhoun, J. T. Wilkins, Jr., and Chas. Hayes.

Helena, Ark.—Merchandise.—Wooten-Davidson Company incorporated with \$25,000 capital stock; S. A. Wooten, president; J. F. Epes, vice-president; G. L. Davidson, secretary and treasurer.

Hot Springs, Va.—Land Improvement.—Hot Springs Valley Investment Co. incorporated with \$50,000 capital stock; J. T. McAllister, president; C. P. Jones, vice-president; J. G. McAllister, secretary and treasurer.

Huntington, W. Va.—Packet Line.—Cattlettsburg & Warfield Packet Co. incorporated with \$5000 capital stock by J. F. York, Huntington, A. W. Ronk, Russell Block, both of Cattlettsburg, Ky., and others.

Joplin, Mo.—Michel-Cook Engineering Co. incorporated with \$40,000 capital stock by J. P. Michel, A. P. Cook and W. W. Swank.

Kansas City, Mo.—Contracting.—Missouri Interurban Construction Co. incorporated with \$30,000 capital stock by Charles W. McDaniel, Howard W. Gibson and E. H. Thompson.

Knoxville, Tenn.—Park Improvements.—City contemplates issuing \$50,000 of bonds for park improvements. Address The Mayor.

Lexington, Ky.—Mercantile.—Bryan, Goodwin & Hunt incorporated with \$200,000 capital stock by A. G. Bryan, R. H. Bryan, J. C. Hunt and W. J. Goodwin.

Lexington, Ky.—Garage.—Phoenix Garage Co. incorporated with \$10,000 capital stock; A. L. Hamilton, president; Victor Dodge, secretary and treasurer.

Lively, Va.—Land Improvement.—Norris-Cralle Land Co. incorporated with \$25,000 capital stock; R. O. Norris, Sr., president; R. O. Norris, Jr., secretary; J. B. Cralle, vice-president.

Lincolnton, N. C.—Hardware.—Reid Hardware Co. incorporated with \$25,000 capital stock by H. E. Reid, M. C. Merritt and others.

Little Rock, Ark.—Land Improvement.—Price-Ledbetter Land Co. incorporated with \$50,000 capital stock; C. G. Price, president; A. P. Price, vice-president; C. R. Ledbetter, secretary and treasurer.

Louisville, Ky.—Provisions.—Klarer Provision Co. incorporated with \$20,000 capital stock by Theodore Klarer, Henry A. Broecker, Chester Fry and Joseph Lachner.

Louisville, Ky.—Engineering.—Harris Engineering Co. incorporated with \$30,000 capital stock; W. R. Harris, president; W. J. Von Barries, vice-president; F. S. Vogt, secretary-treasurer; succeeds partnership firm of Harris, Craven & Von Barries, contractors, etc.; address, 617 Paul Jones Building.

Louisville, Ky.—Plumbing.—M. J. Duffy & Sons Co. incorporated with \$25,000 capital stock by M. J. Duffy, John A. Duffy and Martin J. Duffy.

Louisville, Ky.—Publishing.—Kentucky Farm Publishing Co. incorporated with \$5000 capital stock by C. D. Park, P. M. Shy, Paris, Ky.; J. W. Hampton, Versailles, Ky., and others.

Memphis, Tenn.—Mercantile.—W. R. Fleming & Bro. incorporated with \$12,000 capital stock by W. R. Fleming, Ray F. Fleming, Tom Fleming and others.

Memphis, Tenn.—Grain Elevator.—Riverside Elevator & Warehouse Co., recently reported incorporated with \$100,000 capital stock by Walter Webb and others, does not contemplate building in near future.

Mineral Wells, Texas.—Dry Goods.—Boston Dry Goods Co. incorporated with \$30,000 capital stock by Wm. C. Poston, Mineral Wells; G. C. Poston and J. T. Moore, Weatherford, Texas.

Neches, Texas.—Mercantile.—P. W. Ezell Mercantile Co. incorporated with \$16,000 capital stock by P. W. Ezell, A. L. Bowers, both

of Palestine, Texas, and E. A. Edgeworth, Neches.

Norfolk, Va.—Groceries.—A. Brinkley & Co. incorporated with \$100,000 capital stock; A. Brinkley, president and treasurer; E. Tammell, vice-president; J. E. Bass, secretary.

Norfolk, Va.—Merchandise.—Winston Notion Co. incorporated with \$25,000 capital stock; M. Winston, president; E. W. Curdts, vice-president; S. V. Tunstall, secretary and treasurer.

Norfolk, Va.—Pianos, Organs, etc.—Kaufman-Moser Piano Co. incorporated with \$25,000 capital stock; E. H. Kaufman, president; Max Moser, vice-president.

Nowata, Okla.—Land Improvement.—Oklahoma Land & Development Co. incorporated with \$40,000 capital stock by Charles F. Noble, Bret N. Cormack and A. A. Warner.

Oklahoma City, Okla.—Motor Cars.—Citizens' Motor Car Co. incorporated with \$25,000 capital stock; Weston Atwood, president; Guy E. Blackwelder, vice-president; Ray Colcord, treasurer; A. H. Denham, secretary.

Paducah, Ky.—Tobacco Stemming.—John H. Hodge, recently noted to contemplate establishment of tobacco stemming, states he has no intention of building at Paducah.

Rogers, Ark.—Hardware.—Benton County Hardware Co. incorporated with \$50,000 capital stock; W. J. Duke, president; L. P. Kemper, vice-president; Morgan McMichael, secretary; Conley Harrington, treasurer.

Roscoe, Texas.—Hardware.—Harris-Johnson Hardware Co. recently reported incorporated by H. E. Harris, G. H. Johnson and others, will erect two-story brick building; 60x100 feet; ordinary construction; plans by W. R. Hendrickson.

St. Albans, W. Va.—Land Improvement.—Virginia Land Co. incorporated with \$300,000 capital stock by C. J. Pearson, E. C. Colcord, Geo. C. Welmer and others.

St. Louis, Mo.—Printing.—Franklin Printing Co. incorporated with \$3000 capital stock by John G. Borresen, Robert H. McFarland and Ronald F. McFarland.

St. Louis, Mo.—Contracting.—St. Louis & St. Charles Bridge Co. incorporated with \$200,000 capital stock by C. H. Wilcox, G. C. Strauss, M. V. Delahunt and others.

St. Louis, Mo.—Contracting.—M. W. Muir Construction Co. incorporated with \$5000 capital stock by M. W. Muir, Elizabeth Muir and Frank H. Haskins.

Tablequah, Okla.—Publishing.—Cherokee County Publishing Co. incorporated by Geo. Bengel, Bruce L. Keeman, William G. Banker and others.

Tampa, Fla.—Steam Laundry.—Tampa Steam Laundry, Frank L. Wing, proprietor, has had plans prepared by Bonfoey & Elliott, Tampa, for steam laundry; one story; brick or concrete. French dry-cleaning plant will be installed in addition to laundry equipment.

Texarkana, Texas.—Transfer.—Twin City Transfer Co. incorporated with \$10,000 capital stock by J. F. Hunter, S. M. Daniels and F. A. Hunter.

Texarkana, Ark.—Transportation.—Texarkana Transportation Co. incorporated with \$24,000 capital stock by J. F. Hunter, S. M. Daniels and F. A. Hunter.

Texarkana, Texas.—Transportation.—Hunter Transportation Co. incorporated with \$10,000 capital stock by J. F. Hunter, S. M. Daniels and F. A. Hunter.

Tuttle, Okla.—Land Improvement.—Tuttle Improvement Co. incorporated with \$10,000 capital stock by G. M. Mell, H. E. Green, Louis Meder and others.

Waynesville, N. C.—Printing.—Waynesville Printing Co. incorporated with \$10,000 capital stock by W. C. Allen, W. T. Lee, H. A. Love and others.

Texarkana, Texas.—Texarkana Seed & Implement Co. incorporated with \$25,000 capital stock by K. H. Leonard, H. C. Ratcliff and R. P. Dorough.

Thomaston, Ga.—Printing Plant.—Times Printing Co. previously reported incorporated, contemplates erection of two-story fireproof building for printing plant. (See "Atlanta, Ga., Interstate Holdings Co.")

Thurmond, W. Va.—Groceries.—Model Grocery Co. incorporated with \$10,000 capital stock by J. Hugh Miller, Thurmond; J. W. Haynes, W. C. Miller, both of Alderson, W. Va., and others.

Uvalde, Texas.—Supplies.—Southern Supply Co. incorporated with \$10,000 capital stock by B. L. Crump, W. M. Rascoe and J. M. P. Laird.

Winston-Salem, N. C.—Plumbing.—Maynard-Crutchfield Co. recently reported incorporated with \$25,000 capital stock by F. G. Crutchfield and others, will install pipe-

threading machinery; officers not yet elected. (See "Machinery Wanted.")

MISCELLANEOUS MANUFACTURING PLANTS

Algiers, Station New Orleans, La.—Oil Works.—Guinseur & La Danois awarded contract to R. C. Houston, 705 Malson Blanche, New Orleans, for erection of oil station at Algiers, consisting of two buildings, with boiler, pump, tank and reservoir.

Birmingham, Ala.—Candy.—Nunnally Candy Co. incorporated with \$5000 capital stock; J. H. Nunnally, president and treasurer; Winship Nunnally, vice-president and secretary.

Bristol, Va.—Tenn.—Mattresses.—C. R. Scharf will establish plant for manufacturing mattresses; capacity, about 60 mattresses daily; to operate as Bristol Manufacturing Co.

Bullochville, Ga.—Fertilizers.—Bullochville Home Mixture Guano Co., recently reported incorporated, will establish fertilizer-mixing plant; daily capacity 100 tons; will erect brick and wood building 80x114 feet; ordinary construction; cost \$5000; machinery purchased; B. F. Bulloch, president; W. B. Betts, secretary and treasurer.

Chattanooga, Tenn.—Candy.—Trigg Candy Co., W. E. Brock, president, 1111 Chestnut St., previously noted to increase capital stock to \$200,000, has completed new boiler plant, and is still considering extension of candy factory by erection of three or four-story building adjoining present factory and warehouse; new structure to be 65x150 feet; brick; composition roof. If erected as proposed, size and capacity of plant will probably be doubled.

Chattanooga, Tenn.—Umbrellas.—Knoxville Umbrella Co., Knoxville, Tenn., contemplates, it is reported, establishment of umbrella factory in Chattanooga, and will increase capital stock.

Dallas, Texas.—Brooms, Feather Dusters, etc.—Spikes Bros., 241 Young St., will erect factory building to double present plant; two stories; brick; 60x100 feet; at least two new lines will be added, including manufacture of feather dusters.

Fort Worth, Texas.—Cotton Collars.—Cotton Collar Co. incorporated with \$20,000 capital stock by W. D. Couch, L. P. Robertson and others.

Grafton, W. Va.—Window Glass.—Grafton Window Glass Co. contemplates installation of machinery in plant to replace blowers.

Guthrie, Okla.—Cotton-oil Refinery.—Company has been organized with \$50,000 capital stock by W. J. Dibbens and Charles Alder to take over plant and equip for cottonseed-oil refinery.

Lake City, Fla.—Medicine.—Paxon Medicine Co. incorporated with \$5000 capital stock; William O. Paxon, president and general manager; John D. Crabbs, secretary and treasurer.

Louisville, Ky.—Wall Plaster.—Southern Wall Plaster Co., Floyd and A Sts., recently reported incorporated, will manufacture patent plaster; daily capacity, 30 tons; A. J. Bannon, president; J. Fred Jeffers, vice-president; E. J. Kollros, secretary and treasurer.

Lynchburg, Va.—Medicine.—Conquerine Company incorporated with \$25,000 capital stock; R. G. Leftwich, president; W. D. Le Grand, vice-president; J. E. Moon, secretary and treasurer.

Little Rock, Ark.—Cotton Picker.—Babbett Cotton Picker Co. incorporated with \$25,000 capital stock; H. S. Kennedy, president; R. D. Duncan, vice-president; H. A. Babbett, secretary; W. W. Rightsell, treasurer; to establish plant for manufacturing cotton picker invented by Mr. Babbett.

Macon, Ga.—Confectionery.—Lawton, Jordan & Co. incorporated with \$25,000 capital stock by Richard F. Lawton, Robert G. Jordan, John C. Holmes and others.

Marion, Va.—Drugs.—Carson Drug Co. incorporated with \$10,000 capital stock; L. S. Macon, Jr., president; W. D. Macon, vice-president, both of Charlottesville, Va.; S. J. Carson, secretary and treasurer, Marion.

Memphis, Tenn.—Vinegar.—Burgie Vinegar Co., recently reported incorporated with \$50,000 capital stock, will continue manufacture of vinegar; capacity of plant, 2000 gallons daily; no machinery needed.

Memphis, Tenn.—Tobacco.—Best & Russell Co., Chicago, Ill., has rented Chickasaw Guards' Armory and will equip for manufacturing tobacco; plant to be distributing point for South.

Miami, Fla.—Castor-bean Products.—C. J. Rose is progressing with plans for establishment of plant (recently mentioned) to manufacture castor-bean products; incorporation not completed; building will be erected;

about 40x100x20 feet; concrete blocks; semi-fireproof; plans by B. F. Davis, Miami; hydraulic presses and oil-refining machinery to be purchased; will make cold pressed castor oil and by-products, such as fertilizers, lubricating oils, etc. (See "Machinery Wanted.")

Mobile, Ala.—Drugs.—Van Antwerp Drug Corporation incorporated with \$50,000 capital stock; Garret Van Antwerp, president; Andrew Van Antwerp, vice-president; James C. Van Antwerp, secretary.

Palmetto, Ga.—Band and Collar Factory.—Hal L. Johnston, president of Palmetto Cotton Mills, will incorporate company with capital stock of \$25,000 to manufacture back bands and collars; buildings and power are ready; machinery has been purchased; production to begin by May. (Lately noted under "Textile Mills.")

Paris, Ky.—Distillery.—James A. McGovern, New York, has, it is reported, purchased (from Kentucky Distillers & Warehouse Co.) distilling plant at Paris, will install new machinery and operate.

Richmond, Va.—Pianos.—Cable Piano Co. incorporated with \$25,500 capital stock; J. G. Corley, president, Richmond; E. P. McPherson, secretary and treasurer, Evanston, Ill.; S. W. Greener, assistant secretary and treasurer.

St. Louis, Mo.—Paper Boxes.—Corrugated Paper Products Co. incorporated by J. C. Bulls, Ley P. Rexford and Robert B. Wallace.

St. Louis, Mo.—Glass.—Conde Neal Glass Co. has increased capital stock from \$100,000 to \$250,000.

St. Louis, Mo.—Neckwear.—L. Schoenfeld Manufacturing Co. organized to manufacture neckwear; has leased space in Rosenheim Building and will install equipment.

St. Louis, Mo.—Beer.—Missouri Weiss Beer Brewing Co. incorporated with \$60,000 capital stock by Christopher Stettner, Otto Thoma, Leonard H. Goss and others.

St. Louis, Mo.—Lead and Flaxseed Products.—Euston Lead Co. incorporated with \$100,000 capital stock by Eustace C. Wheeler, Edwin Euston and Irwin Walker.

St. Louis, Mo.—Glass and Paint.—Campbell Glass & Paint Co. is having plans prepared by Baker & Knell, St. Louis, for structure to replace plant reported burned in October; four stories and basement; 125x83 feet; slow combustion material; 40,000 square feet floor space; cost about \$50,000.

Tulsa, Okla.—John O. Mitchell has purchased controlling interest in Webster refinery and will operate; will erect 20,000-barrel tank near refinery; capacity of plant, 200 barrels daily.

Tulsa, Okla.—Ice-cream.—W. L. Thomas has, it is reported, received plans and specifications for ice-cream factory.

Washington, D. C.—Bakery.—Mount Pleasant Baking Corporation incorporated with \$25,000 capital stock; John Bender, 2127 G St. N. W., president; Geo. Hanf, secretary; Carl Hoffman, treasurer; leased Carl Hoffman's bakery at Mount Pleasant; for bread, cakes and pies.

RAILWAY SHOPS, TERMINALS, ROUNDHOUSES, ETC

Norfolk, Va.—Norfolk & Southern Railway Co. receivers, Thomas Fitzgerald, general manager, have notification of decree of court authorizing the \$1,000,000 worth of improvement certificates reported in October. Improvements to include \$50,000 office building, \$12,500 for furniture and fixtures, \$30,000 freighthouse, etc., at Norfolk; completion of Albemarle Sound Bridge near Edenton, N. C., \$50,000; additional facilities, tools and equipment for Newbern (N. C.) machine shops, \$65,000; car float bridge at Berkley, Va., \$10,000; repairing Beaufort (N. C.) trestle bridge, \$15,000; replacing bridges, \$17,500, and other improvements, as stated in previous item.

ROAD AND STREET IMPROVEMENTS

Albany, Ga.—City will probably soon begin proposed municipal improvements, bond issue of about \$80,000 (previously reported) having become available; betterments will include laying of additional paving, extension of sanitary sewer system, improvement of drainage facilities, opening of new street about one and one-half miles long and erection of new City Hall or remodeling of present building. Address The Mayor.

Andrews, N. C.—Highway Commission of Valleytown proposes to issue \$25,000 in bonds to macadamize roads. J. Q. Barker is president of commission.

Atlanta, Ga.—City is considering construction of boulevard from College Park to At-

lanta, distance of about six miles. Address The Mayor.

Benwood, W. Va.—City will pave about 2000 yards with either brick or blocks; bids to be opened January 12; John Blake, chairman of committee. (See "Machinery Wanted.")

Guthrie, Okla.—City awarded contract to Chicago Asphalt & Rubber Co., Chicago, Ill., for 162,851 square yards of asphalt paving and 98,294 square yards of brick paving.

Haskell, Texas.—City has voted \$5000 of bonds for street improvements. Address The Mayor. (Recently mentioned.)

Houston, Texas.—City awarded contract to McAshan & Williams of Houston for placing concrete curbing along San Jacinto street from McKinley to Leland street, amounting to about 2500 linear feet of curbing, including some already existing brick curbing. (John C. Underwood recently mentioned as having contract for paving.)

Kingston, Okla.—Business men will construct proposed cement sidewalk. T. C. Jones, Mayor.

Knoxville, Tenn.—Knox county is considering issuance of \$50,000 of bonds for road improvements; A. D. Collier, County Judge.

Macon, Ga.—City Council is considering appropriation of about \$10,000 for street improvements, including paving of Cotton and Washington avenues and Poplar street; total expenditure will approximate \$30,000, of which \$10,000 will probably be paid by taxpayers and \$10,000 by railway company. (Lately mentioned.)

Salem, Ark.—Fulton County Court has appropriated \$5000 for construction of macadamized road from Mammoth Spring, Ark., to Salem, a distance of 20 miles. This is beginning of systematic construction of good roads. Address County Commissioners.

Savannah, Ga.—John W. Howard, City Engineer, and W. F. Brown, County Engineer, have submitted final report and estimate cost of building road across Hutchinson Island and trestle and drawbridge over Back River to connect with proposed road to Beaufort, S. C., at \$50,000; estimate, based on partial surveys of Hutchinson Island, Back River and part of Beaufort county, covers construction of trestle 1000 feet long, connecting Savannah River with dyke on Hutchinson Island, \$10,000; wharf for landing, \$2000; embankment for 24-foot roadway 3600 feet long across island, \$12,000; trestle 2300 feet long across Back River, \$22,000; steel drawbridge of two 30-foot spans connecting Hutchinson Island with South Carolina shore, \$3000; two concrete culverts, \$1000. This does not include cost of ferryboat to handle traffic between city and Beaufort county, which it is expected will be arranged for by city in conjunction with Seaboard Air Line Railway. H. E. Wilson is chairman of special committee. (Mentioned in November.)

Texarkana, Texas.—City's bond issue of \$250,000, recently reported voted for road construction and improvement on streets in Precinct No. 1, including Texas half of Texarkana, has been declared illegal; another election will probably be held. Address County Commissioners.

SEWER CONSTRUCTION

Albany, Ga.—City will extend sanitary sewer system; \$80,000 is available for this and other improvements. (See "Road and Street Improvements.") Address The Mayor.

Bartow, Fla.—W. W. Lyon, Jacksonville, Fla., and E. M. Gibbons, assistant engineer, are surveying city for purpose of making estimate on system of sewerage.

Bryan, Texas.—City contemplates constructing sewer system. J. T. Maloney, Mayor. (See "Water-works.")

Franklin, La.—City has awarded contract to Alken-O'Reilly Company, New Orleans, La., at \$2,637.88, as recently reported, for 1450 feet of sewer construction; John C. Lewis, Mayor.

Galveston, Texas.—Horton & Horton (probably of Galveston) are lowest bidders at \$41,838.93 or \$41,021.49 (according to manner of payment) for construction of reinforced concrete drain on Avenue M; A. T. Dickey, City Engineer.

Haskell, Texas.—City has voted \$7000 of bonds for construction of sewerage system. O'Neil Engineering Co., Dallas, Texas, has prepared plans and will supervise construction. (Recently mentioned.)

San Antonio, Texas.—City Engineer's Department is completing specifications for 11 miles of sewers to be laid in Prospect Hill Improvement District, for which \$45,000 of bonds have been voted. Guy Borden, acting first assistant, is designing plans for viaduct across Alazan Creek, which will serve as feeder for system. (Prospect Hill Sewer

Committee was previously mentioned as having adopted plans and specifications by J. E. Van Riper, assistant city engineer, for sewer system.)

Shawnee, Okla.—City will, it is reported, expend about \$25,000 in construction of six and eight-inch vitrified-pipe sewers. F. D. Brown of Shawnee is engineer. (City recently reported to vote on issuance of \$120,000 of bonds.)

Woodlawn, P. O. Birmingham, Ala.—City has voted \$15,000 of bonds for extension of sewer system. Address The Mayor. (Recently mentioned.)

TELEPHONE SYSTEMS

Doniphan, Mo.—Farmers' Mutual Telephone Co. incorporated to establish telephone system.

Lexington, S. C.—Company has been organized with Haskell Schull, president; Marshall Hook, vice-president; W. K. Hook, secretary, and G. A. Kammer, treasurer, to construct telephone line.

Meridian, Miss.—Home Telephone Co. contemplates extending its line to Whitfield, Ala.; about \$400,000 will, it is reported, be expended.

Pawnee, Okla.—Coal Creek Telephone Co. incorporated by John Wolfe, Pawnee; W. J. Nail and J. M. McKill, both of Ralston, Okla.

Tulsa, Okla.—Citizens' Telephone Co., recently reported organized by J. I. Gillespie and others to establish telephone system, has not yet settled plans for building, which will probably be of brick, cement or stone; contractor not engaged; Mr. Gillespie's address, Box 555, Tulsa. (See "Machinery Wanted.")

TEXTILE MILLS

Columbus, Ga.—Yarns.—Bibb Manufacturing Co. is reported as to install additional machinery; now operating 29,056 spindles.

Cuero, Texas.—Cotton Goods.—Cuero Cotton Factory incorporated with capital stock of \$74,481 by Emil Reiffert, J. A. Graves and Otto Buchel.

Greenville, S. C.—Print Cloth, etc.—Brandon Mills, recently noted as having increased capital stock from \$450,000 to \$900,000, will build additional mill, as follows: Size of building, probably 300 by 125 feet, four stories high; contract already let; 25,000 spindles and 700 looms; product, print cloth and converters goods; expect to contract for machinery in January; engineers, Lockwood, Greene & Co. of Boston, Mass.

Laurinburg, N. C.—Hosiery Yarn.—J. P. McRae, president of Scotland Cotton Mill and Dickson Cotton Mill, will organize company, as reported in December, to build mill for manufacturing hosiery yarns; will incorporate during January; to install 15,000 spindles; no contracts have been awarded.

Lebanon, Tenn.—Woolen Goods.—Lebanon Woolen Mills incorporated with capital stock of \$60,000 by H. K. Edgerton, J. J. Askew, H. M. Freeman and others; lately reported proposed.

Madisonville, Tenn.—Hosiery.—Madisonville Knitting Mills reported as having ordered 10 additional knitting machines.

Manchester, Ga.—Cotton Yarns.—Manchester Cotton Mills, lately reported, will erect three-story 104x160-foot building; will probably invite construction proposals in February; 20,000 spindles to be installed for daily production of 15,000 pounds of yarns; A. Francis Walker, 718 Austell Bldg., Atlanta, Ga., is engineer in charge. Address Manchester Cotton Mills, care of Fuller E. Callaway, chairman advisory board, Lagrange, Ga.

Oklahoma City, Okla.—Cotton Goods.—Brown Cornelson is interested in plan to build cotton mill.

Spray, N. C.—Cotton and Woolen Goods.—Carolina Cotton & Woolen Mills Co. incorporated with capital stock of \$1,000,000 by B. Frank Mebane and associates.

Taylorville, N. C.—Cotton Yarns.—Henry M. Wilson of Taylorville and Fred H. White of Charlotte, N. C., propose organizing \$100,000 cotton-mill company recently reported; \$50,000 now available; 5000 spindles to be installed. They are officers of Taylorville Cotton Mills.

Trenton, Tenn.—Yarns.—Trenton Cotton Mills will, it is reported, install additional machinery; present equipment, 10,500 ring and 4000 twister spindles.

Tryon, N. C.—Dyeing and Finishing.—Tryon Hosiery Co. will erect two-story 50x200-foot building of mill construction, costing \$15,000, for dyeing and finishing plant lately reported; machinery will also cost about \$15,000; daily capacity to be 2000 dozen pairs hosiery; Herbert M. Wilcox, architect and engineer in charge; bids for machinery are invited.

WATER-WORKS

Barboursville, W. Va.—United Utilities Co., L. L. Dowdhat, manager, will, it is reported, construct combined water, electric and steam heating plant. (See "Electric-light and Power Plants.")

Bryan, Texas.—City will vote on issuance of bonds to secure better water and light service and sewerage system; it is proposed to either purchase present water and light plant and add sewerage system or build entire new plants; J. T. Maloney, Mayor.

Cleveland, Tenn.—City will purchase Cleveland Water Co.'s plant for \$50,000. Charles S. Mayfield, Mayor.

Crockett, Texas.—City has voted issuance of water-works bonds. Address The Mayor.

Duncan, Okla.—City has voted \$46,000 of bonds for extension of water-works and erection of city hall and school buildings. Address The Mayor.

Eldorado, Ark.—Eldorado Light & Water Co. incorporated with John Holmes, president. (See "Electric-light and Power Plants.")

Fort Worth, Texas.—Fort Worth & Denver City Railway contemplates expending about \$17,000 in construction of water system for fire protection at Childress; plant will include steel tower tank 100 feet high, 100,000 gallons capacity; underwriter pump; reservoir of 100,000 gallons capacity. Bids have been closed. J. H. Hawley, consulting engineer, Fort Worth, Texas, in charge of work. (Recently mentioned.)

Haskell, Texas.—City has voted \$23,000 of bonds for construction of water-works. O'Neil Engineering Co., Wilson Bldg., Dallas, Texas, has prepared plans and will supervise construction. (Recently mentioned.)

Hubbard, Texas.—A. C. Morgan, Clarendon, Texas, purchased water-works at Hubbard for \$25,000.

Indianola, Miss.—Houston & Cunningham, 705 Maison Blanche, New Orleans, La., have been retained as consulting engineers and will prepare plans for improvements to water-works system at Indianola, costing \$15,000. Bids will be invited within about 60 days.

Kiowa, Okla.—City has voted \$38,000 of water-works bonds. Address The Mayor.

Meridian, Miss.—Piedmont Construction Co., Atlanta, Ga., is lowest bidder at \$11,335 for construction of reinforced-concrete reservoir. Bids were also received on furnishing and erecting 5,000,000-gallon horizontal cross-compound and flywheel pumping engine, amounts ranging from \$13,650 to \$22,350, according to size. W. G. Wetmore is City Engineer. (Recently mentioned.)

Port Deposit, Md.—Jacob Tome Institute will construct additional reservoir to supply water for school; offices at 401 American Building, Baltimore, Md.

Richmond, Va.—M. R. Sherrard, hydraulic engineer, Newark, N. J., and M. J. Roelker, concrete engineer of Richmond, submitted report to subcommittee on water, advising as to present condition of flume and best means of bringing water from settling basin to pump-house. Four methods suggested—wood lining to present concrete tube, which engineers did not believe practicable, at estimated cost of \$100,000; steel pipe laid in trough formed by taking off crown of wrecked concrete flume and using it as foundation; iron lining to present tube, and construction of lock-joint concrete tube. Subcommittee recommended to full committee that resolution be forwarded to council appropriating \$75,000 to build flume and that bids be called on the four methods; Charles E. Bolling, City Engineer.

Seymour, Texas.—City will open bids January 19 for purchase of material required in construction of water-works system, consisting of return tubular boiler, duplex pump, cast-iron pipe, fire hydrants and valves. O'Neil Engineering Co., Wilson Bldg., Dallas, prepared plans; \$28,000 of bonds have been voted, as recently mentioned. (See "Water-works Equipment" in "Machinery, etc., Wanted.")

Tampa, Fla.—Tampa-Water-Works Co., Chester McFarland, manager, has filed mortgage for \$700,000, and plans to extend and improve water-works system.

Tuscaloosa, Ala.—City has made arrangements for extending water mains about 4600 feet; C. E. Abbott, manager Water-Works Commission.

Tulsa, Okla.—City has let contract to Swift & Alt, St. Louis, Mo., at \$27,000 for construction of sedimentation basins; will install pump recently mentioned; pump to have capacity of 3,000,000 or 4,000,000 gallons; T. C. Hughes, engineer; W. E. Rhode, Mayor. (See "Machinery Wanted.")

Washington, D. C.—P. H. & I. Conlon, Newark, N. J., have contract at \$6388 for con-

struction of auxiliary water system and fire protection for Home for Aged and Infirm, subdivisions of Bellevue and Blue Plains; will erect small addition to power-house and elevated tank of 23,000 gallons capacity, construct pipe lines, drill artesian well, etc. (Recently mentioned.)

WOODWORKING PLANTS

Athens, Ga.—Sash, Doors and Blinds.—Standard Lumber & Manufacturing Co. incorporated with \$50,000 capital stock by Henry Hull; will establish sash, door and blind factory.

Brewton, Ala.—Baskets.—Lovelace Lumber Co. will rebuild basket factory and sawmill reported destroyed by fire; loss about \$75,000.

Kansas City, Mo.—Trunks.—Luce Trunk Co. incorporated with \$25,000 capital stock by Lorenzo Luce, Milton Luce and Alice Luce.

Memphis, Tenn.—Veneer.—Evansville Veneer Co., C. W. Talz, president, Evansville, Ind., will, it is reported, establish veneer plant in Memphis; has purchased tract of land and proposes to erect five-story factory building and a number of cottages; cost of plant about \$150,000.

Morristown, Tenn.—Carver Wagon Co., recently reported incorporated with \$50,000 capital stock, will organize with O. R. Carver president and general manager; will enlarge and continue established plant.

Nashville, Tenn.—Sash, Doors, Blinds, etc. McGinnis & Co. incorporated with \$30,000 capital stock by W. P. McGinnis, R. K. Horn, W. H. Gordon and others.

Nashville, Tenn.—Furniture.—Standard Furniture Co., W. U. Davidson, president, recently noted to increase capital stock to \$250,000, will erect \$15,000 building for finishing department and warehouse; three-story brick structure; 60x300 feet; mill construction; no further power or machinery needed.

Nashville, Tenn.—Furniture.—Standard Furniture Co. has increased capital stock from \$100,000 to \$250,000.

Oklahoma City, Okla.—Boxes, Barrels, etc.—W. T. Letts Box & Cooperage Co., St. Joseph, Mo., contemplates establishment of box and cooperage plant in Oklahoma City; reported negotiating for local box and veneer plant, with intention of increasing capacity by adding machinery and erecting additional buildings.

Portsmouth, Va.—Butter Dishes.—Lay & Balcom Manufacturing Co., O. B. Lay, president and treasurer, recently reported incorporated (under "Miscellaneous Manufacturing Plants"), will operate plant to manufacture butter dishes; capacity, 150,000 to 200,000 daily; machinery supplied.

Queenstown, P. O. Birmingham, Ala.—Doors, Sash, etc.—The Queenstown Company, 2113 First Ave., Birmingham, reports that planing mill and sash, door and blind factory will be located within 30 days.

Roanoke, Va.—Heading and Staves.—Roanoke Cooperage Co. will rebuild plant recently noted burned; light buildings to be erected; will need some repairs to machinery, which was not badly damaged.

San Antonio, Texas.—Coffins.—J. S. Borden is promoting organization of company to establish plant for manufacturing coffins and undertakers' supplies.

Sanford, Fla.—Carriages, etc.—Sanford Carriage Works, W. H. Underwood, proprietor, will establish carriage factory recently mentioned; will erect two-story brick building 50x117 feet at cost of \$5000; will open proposals at once for woodworking machinery for manufacturing buggies and wagons; will also install general blacksmithing equipment.

St. Louis, Mo.—Vehicles.—Banner Buggy Co. incorporated with \$700,000 capital stock by Russell E. Gardner, Hugo F. Cartwright, A. T. Hopke and others.

Troy, Ala.—Crates.—Troy Veneering Crate Co. incorporated with \$15,000 capital stock by C. M. Edick, John W. Bedford, E. F. Dunbar and others.

Wheeling, W. Va.—Boxes.—Spindler & Dudley Company, Wheeling, at \$17,897, is lowest bidder for erection of box factory for Christian Steinmetz & Sons, to replace present plant; four stories; fireproof construction; brick with Cleveland stone trimmings; floors supported by steel structure; boiler and engine rooms to have fireproof walls and floors; floor space 30,000 square feet; plans by A. L. Kleives, Wheeling. (Recently mentioned.)

BURNED

Atlanta, Ga.—J. J. Haverly's residence, recently reported burned, was but slightly damaged.

Baltimore, Md.—Atlantic Transport Co.'s pier and warehouse; loss about \$200,000; Jas. C. Gorman, resident manager, 201-207 Chamber of Commerce Bldg.

Brewton, Ala.—Lovelace Lumber Co.'s sawmill and basket factory; loss about \$75,000.

Bunkie, La.—C. E. Haas' store building, loss \$12,000; J. C. Palmer's building, loss \$12,000; G. C. Scallan's building, loss \$6600; Bunkie Review's printing plant, loss \$1500; W. P. Smart's building, loss \$3500; T. M. Willis' building, loss \$4500.

Capron, Va.—G. W. Truitt & Co.'s sawmill plant; loss about \$15,000.

Chattanooga, Tenn.—Dave A. Johnston's cotton gin in Clear Creek township.

Chestertown, Md.—Flour and feed mill; owned by Charles Brown and John E. Morris; loss about \$2500.

Columbus, Miss.—E. S. Hale's residence; loss about \$4500.

Dacoma, Okla.—B. K. Gordon's hotel and store; loss about \$4000.

Dallas, Texas.—Furniture warehouse used by W. M. Strickland and owned by C. A. Keating; reported loss on building about \$11,000.

Delchamps, Ala.—St. Timothy's Catholic Church at Heron Bay; Rev. Father Shea, pastor.

Eatons, W. Va.—J. E. Carle's residence; loss about \$7000.

Fayette, Miss.—Fayette Lumber Co.'s plant.

Eunice, La.—J. F. Launey's residence; loss about \$4000.

Fairfield, Ark.—J. F. Simmons' cotton gin; loss about \$1500.

Felixville, La.—Dunn & Rogers' steam gin and grist mill; loss about \$3000.

Fort Smith, Ark.—Western Grain Co.'s hay warehouse; Benno-Stein Wholesale Dry Goods Co.'s warehouse.

Jonesboro, Ark.—Lee Johnson's residence; loss about \$6000.

Madisonville, Texas.—A. Vlier's store building, loss about \$7000; Randolph & Randolph's law offices, loss about \$10,000; Burtis Bros. & Day's store building, loss about \$6500.

Mulberry, Fla.—West Side Hotel; reported loss \$5000.

Nashville, Tenn.—John A. Tyner's grain-house; building owned by Mrs. Ella Connell; loss about \$11,000.

New Decatur, Ala.—Decatur Cottonseed-Oil Mill; loss about \$10,000.

New Orleans, La.—A. H. White Company, Ltd.'s, tar-paper plant; loss about \$20,000.

Oxford, Md.—W. A. Davis' residence, Standford Hall; loss \$10,000.

Paragould, Ark.—Parsonage of First Methodist Church; loss about \$4000; Rev. M. M. Smith, pastor.

Piggott, Ark.—Fridenberg & Co.'s business block; Cole & Son's livery barn; W. T. Barlow's City Hotel; C. M. Fuson's residence; City Bakery's plant; John Vineyard's residence; W. H. Harris' residence; loss about \$20,000.

Prosper, Texas.—Prosper House; loss about \$6000; C. C. Maynard, manager and owner.

Proximity Station, Greensboro, N. C.—Proximity Manufacturing Co.'s warehouse, recently reported burned, was only slightly damaged.

Rockwall, Texas.—Rockwall Grain & Elevator Co.'s elevator and barn; loss about \$10,000.

Savannah, Ga.—W. D. Champion's wood-yard and sawmill; loss about \$4000.

Sallisaw, Okla.—Wheeler Gin Co.'s cotton-house; loss about \$3000.

Sherman, Texas.—Ber. O'Neal's blacksmith shop; building owned by Mrs. D. Fowler.

St. Francisville, La.—M. J. Daniel & Sons' steam cotton gin; loss about \$3500.

St. Joseph, Mo.—Nelson Morris Packing Co.'s fertilizer building and oil-tank warehouse; loss about \$125,000; main office, Chicago, Ill.; T. E. Wilson, general manager.

Valdosta, Ga.—Fender Lumber Co.'s planing mills and drykiln; loss about \$10,000.

Vernon, Texas.—Vernon Electric Light & Power Co.'s plant, loss \$10,000; owned by Blanton & Hockersmith.

Vernon, Texas.—A. J. Peck's building; M. Picken's building; J. D. Tyson's building; Stephens & Hahn's building; Smartwood & Co.'s building; total loss about \$25,000.

Whitney, S. C.—Sloan Bros' store building; Thomas & Co.'s livery stable; loss about \$15,000.

BUILDING NOTES

APARTMENT-HOUSES

Knoxville, Tenn.—Max Reddelsheimer has had plans prepared by Thomas E. Marr of Knoxville for apartment-house; two stories; brick; cost \$8500.

Macon, Ga.—Polhill Wheeler contemplates erection of four-story brick apartment-house.

St. Louis, Mo.—Mariner & LaBeaume of St. Louis have prepared plans for apartment-house to be erected at 535 Clara avenue; three stories; six apartments of eight rooms each; brick and stone; terra-cotta trimmings; 88x70 feet; cost about \$75,000. Kingsbury Realty Co. will supervise construction; Godfrey & Hirsch will secure building contracts; both of St. Louis.

Washington, D. C.—Ben B. Bradford, Bradford Bldg., Washington, has not yet set date of opening bids for erection of apartment-house for which he was recently noted to prepare plans; will be eight-story fireproof structure; 65x60 feet; hot-water heat; electric lighting; Otis elevator; cost \$100,000.

BANK AND OFFICE BUILDINGS

Cleburne, Texas.—Farmers and Merchants' National Bank will renovate banking rooms, expending about \$15,000 for furniture and fixtures.

Fayetteville, N. C.—Southern Life Insurance Co. will receive bids until January 21 for erection and completion of five-story office building in accordance with plans and specifications by W. B. Rose, architect, Greensboro, N. C.; certified check for \$1000, payable to C. J. Cooper, chairman building committee; proposed structure of steel-frame construction; steam heat; electric lighting and electric elevators; estimated cost, \$50,000. (Recently mentioned.)

Fort Smith, Ark.—First National Bank Building Co., F. A. Handlin, president, will, it is reported, award contract January 11 for erection of eight-story fireproof bank and office building; cost \$300,000; plans by Sanguinetti & Staats, Fort Worth, Texas. (Recently mentioned.)

Grenada, Miss.—Grenada Bank has had plans prepared by Harry N. Austin, Jackson, Miss., for bank and office building; two stories and basement; 104x40 feet; stone and brick; ordinary fireproof construction; steam heat; electric lighting; hot-water heating; estimated cost, \$25,000. (See "Machinery Wanted.")

Jackson, Miss.—J. & B. Hart will erect office building to cost about \$50,000.

Johnson City, Tenn.—George L. Carter will erect office building and department store to cost \$50,000.

Kansas City, Mo.—Orear-Leslie Investment Co. will erect office building; 10 stories; 31x142 feet; first floor to have height of 18 feet and to be arranged for banking-room; each of 10 floors to have 3500 feet of floor space; exterior of cut stone for first story and red pressed brick with cut-stone trimmings for remainder; two passenger elevators; estimated cost, \$150,000; plans by Jas. A. Priestly of Kansas City; contract will soon be awarded.

Nashville, Tenn.—Union Bank & Trust Co. is having plans prepared by Mowbray & Uffinger, 92 Liberty St., New York, for five-story bank and office building, estimated to cost \$150,000. (Recently mentioned.)

Oklahoma City, Okla.—F. M. Pirle and G. W. Seales contemplate expenditure of about \$35,000 for construction of four-story office building recently mentioned; contract not yet awarded.

Oklahoma City, Okla.—Bass & Harbour Furniture & Carpet Co. will erect office building; eight stories and basement; fireproof; 40x140 feet.

Oklahoma City, Okla.—Mrs. Augusta Wright will erect office building; five stories; 140x50 feet; probably of reinforced concrete; two elevators; cost \$85,000; plans prepared by Architect McMillan.

CHURCHES

Atlanta, Ga.—Bids for Wesley Memorial Church will be received until January 13, as follows: (a) For building; (b) for heating and ventilating; (c) for plumbing and drainage; (d) for wiring and fixtures; (e) for elevators. Specifications and drawings will be sent to contractors on deposit of certified check for \$25. Address George C. Thompson, architect, 1230 Candler Bldg., Atlanta. (See "Machinery Wanted.")

Big Spring, Texas.—First Baptist Church has had plans prepared by Samuel P. Herbert, Waco, Texas, for edifice recently mentioned; 61x84 feet; basement; hot-air heating; electric lighting; estimated cost, \$15,000; bids to be opened January 15, as recently stated; plans and specifications on file in office of Morrison & Morrison at Big Springs; C. S. Holmes, chairman building committee.

Bloomington, Ind.—Central Methodist Episcopal Church will receive bids until January 28 for construction of church building to cost \$80,000 to \$85,000. Particulars can be

had by calling on Bloomington National Bank or William H. Adams.

Hagerstown, Md.—Trinity Lutheran Church is having plans prepared for edifice to cost \$60,000. Address The Pastor, Trinity Lutheran Congregation. (Recently mentioned.)

Kingville, Texas.—Methodist Episcopal Church will expend about \$5000 to erect edifice; frame; acetylene-gas lighting; architect not selected; W. H. McCracken, chairman of committee in charge. (Recently mentioned.)

Lake Charles, La.—Louisiana Conference Association of Seventh Day Adventists, E. L. Maxwell, president, leased site on which to erect edifice, 24x36 feet.

Laurel, Miss.—Methodist Congregation contemplates erecting edifice to cost \$25,000. Address The Pastor, Methodist Church.

Okmulgee, Okla.—M. E. Church, South, W. J. Sims, pastor, Box 255, has not yet employed architect to prepare plans for \$25,000 edifice recently mentioned; as proposed, building will be of pressed brick, 75x90 feet; steam heat; bids to be opened March 1; Dr. O. A. Lambert, chairman.

Richmond, Va.—Tabernacle Baptist Church, Rev. W. L. Ball, pastor, contemplates erection of edifice to cost \$50,000.

COURTHOUSES

Grand, Okla.—Ellis county will have plans and specifications prepared by P. H. Weathers for courthouse, estimated to cost \$50,000. Tentative contract has been made between County Commissioners and Manhattan Construction Co., Guthrie, Okla.

Towson, Md.—Following contractors will submit bids on January 14 to architects, Baldwin & Pennington, 330 N. Charles St., Professional Bldg., Baltimore, for erection of additional wings and certain alterations to Baltimore County Courthouse at Towson: John Waters, 23 E. Center St.; Noel Construction Co., Calvert and German Sts.; J. J. Walsh & Son, 1525 Maryland Ave.; David M. Andrew Company, 404 Vickers Bldg.; Morrow Bros., 218 W. Saratoga St.; Henry S. Rippel, 1-7 Clay St.; John Cowan, 106 W. Madison St.; Walter E. Burnham, 22 Builders' Exchange; J. Henry Miller, 110-112 Dover St.; George A. Blake, 301 Law Bldg.; Monmonier & Sorrell, 308 Laurens St.; Thomas J. Johns, 1514 Harford Ave.; David Peoples, 213 N. Calvert St.; Eugene D. Springer, 424 S. Charles St.; American Contracting Co., American Bldg.; Willard E. Harn, 2700 Huntingdon Ave.; Henry Smith & Sons Company, 116-120 S. Register St.; George W. Ashley Company, 408 S. Charles St.; Baltimore Ferro-Concrete Co., 16 St. Paul St.; and Albert Weber, 31 Builders' Exchange Bldg., all of Baltimore; Daniel Harding, Towson; Henry A. Nagel, Catonsville (station Baltimore); C. C. Smith, Havre de Grace, Md.; B. F. Smith Fireproof Construction Co., Pope Bldg., 817 14th St. N. W., Washington, D. C. (Further details recently mentioned.)

Tulla, Texas.—Swisher County Commissioners have, it is reported, awarded entire contract to Martin, Holderness & Oats, Stamford, Texas, at \$55,694 for erection of courthouse; three stories and basement; brick and stone; Withers & Elliott, Stamford, Texas, have prepared plans; W. B. Hale, County Judge. (Recently noted.)

DWELLINGS

Alvin, Texas.—H. Russell will erect concrete residence.

Anderson, S. C.—A. H. Dagnall will rebuild burned residence within the year.

Baltimore, Md.—Edward J. Donahue, 411 East 2d St., has had plans prepared by Jacob F. Gerwig, 210 East Lexington St., Baltimore, for 26 dwellings, 16 on Hollins street and 10 on Catherine street; two stories; brick; foundations stone, laid in cement; fancy galvanized-iron cornices; cost about \$45,000.

Baltimore, Md.—Robert P. Scott of Sinclair-Scott Company, Wells and Patapsco Sts., will erect residence in Edgecombe Park, to cost about \$10,000.

Baltimore, Md.—Everett S. Eppley of Orr, Eppley & Co., Warner and Stockholm Sts., awarded contract to John D. Baker, 700 East Monument St., Baltimore, for erection of bungalow on Elsinore avenue; one and one-half stories; frame; 30x34 feet; foundation of heavy stone laid in cement; slate roof; cost about \$4000; plans by Henry Tinley, 501 Hoffman Bldg., Baltimore.

Birmingham, Ala.—J. C. Henley awarded contract to T. L. Medders, Birmingham, for erection of proposed \$3500 residence; two stories; frame; ordinary construction; grates; electric lighting.

Birmingham, Ala.—C. L. Richards will

erect residence; two stories; brick veneer; cost \$18,000.

Chattanooga, Tenn.—J. S. McLearn will not erect dwelling. (Recently incorrectly reported.)

Chattanooga, Tenn.—J. T. Lupton, The Elizabeth, awarded contract to West Construction Co., 1001 Market St., Chattanooga, for construction of three reinforced concrete floors in \$100,000 dwelling previously described; no general contract; all work under supervision of W. T. Downing, architect, James Bldg., Chattanooga.

Dallas, Texas.—R. H. Stewart will erect three-story brick dwelling.

Denton, Texas.—North Texas State Normal School has had plans prepared for principal's residence.

Dublin, Ga.—Dan G. Hughes, Danville, Ga., awarded contract to J. A. Kelley, Dublin, for rebuilding of dwelling recently reported burned; cost \$5000; to be completed by February 1.

Eufaula, Ala.—J. E. Methvin will erect residence.

Jefferson, Ga.—H. T. Mobley will rebuild residence and barn recently reported burned.

Kansas City, Mo.—Rams & Messick will erect six detached residences, to cost \$27,000.

Knoxville, Tenn.—J. B. Jones, Box 608, will award contract about January 20 for erection of residence recently mentioned; 8 to 10 rooms; hot-water heat; electric lighting; plans by Baumann Bros., Knoxville.

Knoxville, Tenn.—M. M. Copenhaver, Lonsdale, will erect residence on Sharp's Gap pike.

Memphis, Tenn.—Company organized by Russell Martin and others will erect 30 cottages in Magnolia Park, to cost about \$90,000.

Memphis, Tenn.—H. A. Keppel, 124 Washington Ave., will erect several five and six-room cottages, with hot-air heat and electric lighting; cost \$3500 each; plans and construction by Jones & Cunningham.

Mt. Washington, Md.—J. W. Rausch awarded contract to Gladfelter & Chambers, 2072 Woodberry Ave., Baltimore, Md., for erection of residence on Kenoak avenue, Mt. Washington; two stories and attic; frame; stone foundation; slate roof; hardwood floors; sanitary plumbing; hot-water heating plant; electric lighting; cost about \$10,000; plans by Otto G. Simonson, American Bldg., Baltimore. (Previously mentioned.)

New Orleans, La.—H. Boettner, architect, 1634 Tulane Ave., will prepare plans for two residences on Iberville and Solomon streets; probably two stories.

New Orleans, La.—John O. Chisolm will erect three dwellings; double; frame; two stories; five rooms each.

New Orleans, La.—Henry Boettner, 1634 Tulane Ave., has prepared plans for double two-story residence.

New Orleans, La.—O. M. Anderson will erect double cottage; owner is builder.

New Orleans, La.—J. E. Lally has had plans prepared by N. C. Shaddinger, New Orleans, for double one-story residence.

Pikeville, Ky.—John W. Langley has had plans prepared by Frank P. Milburn, Home Life Bldg., Washington, D. C., for residence in Pikeville.

Ruxton, Station Baltimore, Md.—Mrs. Mary V. Turner and Miss E. B. Lucas awarded contract to Brown & Morgan, Builders' Exchange, Baltimore, for erection of residence in Ruxton; one and a half stories; bungalow type; frame and stucco siding; slate roof; 46 feet 10 inches by 57 feet 4 inches; hardwood floors; cost about \$8000; plans by Clyde N. Friz, 11 Pleasant St., Baltimore. (Recently mentioned.)

Washington, D. C.—W. T. Burch, 1327 L St. N. W., awarded contract to W. S. Spencer, Bond Bldg., Washington, for erection of dwelling at 1627 Connecticut avenue; one story; brick; estimated cost, \$20,000; plans by A. B. Mullett & Co., Union Trust Bldg., Washington.

Washington, D. C.—Mrs. Beriah Wilkins is having plans prepared by Bruce Price & De Sibour, 1135 Broadway, New York, for residence at Massachusetts avenue and 17th street N. W.

Winchester, Ky.—Hadden & Stevenson will erect brick dwelling recently mentioned, and will also build three eight-room two-story frame dwellings; natural-gas and hot-water heating; electric lighting; plans by J. W. Crane, contractor, W. W. Stevenson, 214 Burns Ave., all of Winchester. (See "Machinery, etc., Wanted.")

GOVERNMENT AND STATE BUILDINGS

Americus, Ga.—Postoffice.—George Becking, Chattanooga, Tenn., is lowest bidder at

\$51,257 for erection of postoffice building at Americus. James Knox Taylor, Treasury Department, Washington, D. C., is Supervising Architect. (Recently mentioned.)

Frankfort, Ky.—Capitol.—Geo. Baker Long, News Bldg., Chattanooga, Tenn., awarded subcontract to James Dutton, News Bldg., Chattanooga, at \$34,000, to build cut-stone facing for parapet or retaining wall, 1400 feet long and 10 inches thick; wall to be 18 inches thick, stone face backed by brick; interior of terrace divided into rooms built of reinforced concrete and lighted from above; surface paved with vitrified brick; subcontract for paving and reinforced concrete work not yet awarded. (In November, contract for architectural terraces in connection with new State Capitol building noted let to Mr. Long at \$75,000.)

Lake Charles, La.—All bids received for erection of U. S. postoffice at Lake Charles are in excess of appropriation, which is \$104,000; appropriation for site and building is \$125,000; proposals will be rejected and plans revised so as to bring cost within amount available. James Knox Taylor, Treasury Department, Washington, D. C., is supervising architect. (Recently mentioned.)

HOTELS

Chattanooga, Tenn.—E. R. Betterton and J. O. Martin, care of E. R. Betterton & Co., 717 Market St., will erect \$40,000 hotel at Market and Alabama streets; architect to be selected; building to have five stories and basement; 55x150 feet; brick, stone and concrete; 75 rooms; concrete floors; all modern improvements; to be completed within six months and leased for term of years to C. A. Brelsford, manager of Central Depot restaurant.

Fort Worth, Texas.—Winfield Scott is having plans prepared by Sanguinetti & Staats of Fort Worth for enlarging Metropolitan Hotel; to either make entire building five stories high or make half of structure 10 stories high. Mr. Scott is owner and George Stillman is proprietor.

Franklin, Va.—C. F. Neils, Portsmouth, Va., has prepared plans and has general contract for erection of 30-room hotel at Franklin for R. H. D. Cobb. (Previously mentioned.)

Johnson City, Tenn.—George L. Carter will erect hotel to cost \$50,000.

Monterey, Tenn.—Imperial Hotel Co. incorporated with \$25,000 capital stock by J. T. Wilder, T. E. Goff, T. D. Price and others.

Memphis, Tenn.—A. J. Fabacher, New Orleans, La., and others contemplate, it is reported, erection of hotel at Memphis; 12 stories; stone and white brick.

Rhea Springs, Tenn.—Rhea Springs Hotel Co. will soon announce plans for improvements to Rhea Springs Hotel property, recently noted purchased by Montgomery S. Gibson and associates. Mr. Gibson was formerly manager of Lookout Inn, Chattanooga, Tenn.

St. Petersburg, Fla.—H. Barnum, superintendent of agencies of Agricultural Fire Insurance Co., Binghamton, N. Y., is principal of syndicate which proposes to erect hotel in St. Petersburg; structure to be three stories; Spanish style of architecture; shell dash; terra-cotta roof; contain 140 rooms and 50 baths; Noll A. Mitchell is local representative. (Recently mentioned.)

MISCELLANEOUS STRUCTURES

Atlanta, Ga.—Business Building.—Joel T. Hurt has purchased site 165x135 feet and contemplates erection of business building.

Baltimore, Md.—Clubhouse.—Maryland Motor Boat Club has accepted plans by Theodore Wells Pietsch, American Bldg., Baltimore, for clubhouse at Ferry Bar; two stories; structure will be erected free of the shore and built on piles, connecting with shore by pier; landing floats will be provided at wharves adjacent to building; structure will be frame; slate roof; shingled sides; main floor will be wood finish only; second floor will be plastered; two stairways will connect with roof deck above piazza; cost \$6500.

Baltimore, Md.—Business Building.—Mrs. Robert Rennett, Hotel Rennett, Liberty and Saratoga Sts., awarded contract to Edward Brady & Son, 1109-1113 Cathedral St., Baltimore, for erection of business building at 4 St. Paul street; three stories; 30-foot frontage; plans by Clyde N. Friz, 11 Pleasant St., Baltimore.

Baltimore, Md.—Store Building.—J. Wilson Leakin, Fidelity Bldg., awarded contract to Willard E. Harn, 2700 Huntingdon Ave., Baltimore, for erection of store building at 412 North Howard street; three stories; brick and stone; 25.5x100 feet; cost about \$10,000;

plans by Herbert C. Aiken, 2215 North Calvert St.

Batesville, Ark.—Dormitory.—I. O. O. F. Widows and Orphans' Home will erect dormitory building recently mentioned; two-story structure; veneered brick; about 16 rooms; slate roof; ordinary construction; steam heat; electric lighting; cost \$7500; plans by Chas. Thompson, Little Rock, Ark.; J. W. Case, secretary; A. C. Jones, Hot Springs, Ark., member of building committee; date of opening bids not decided.

Brady, Texas.—Hardware Store.—Mrs. M. C. Dutton will erect hardware building recently reported; architect not chosen; as proposed, structure to be 100x90 feet, with 18-inch walls 20 feet high; fireproof; iron front; electric lighting; cost about \$7000. (See "Machinery, etc., Wanted," W. F. Dutton.)

Camden, Ark.—Business Building.—H. B. & O. L. Lide awarded contract to J. T. Mendenhall, Camden, for erection of business building; 55x100 feet.

Dallas, Texas.—Store Building.—Sanger Bros. will erect store building adjoining present building; 8 or 10 stories; if 10-story structure is erected, four additional stories will be added to present six-story store; new building to correspond in architecture with present one; after improvements suggested are completed another addition will be erected to correspond in size, architecture, etc., with these buildings, making eventually one building of probably 10 stories, 100x100x300 feet.

Dallas, Texas.—Business Building.—C. C. Slaughter has purchased site 94½x107½ feet and will, it is reported, erect business building.

Dover, Ark.—Store Building.—W. A. Baird will erect two-story brick store building.

Elizabeth City, N. C.—Business Building.—Kramer Bros. & Co. will erect three-story store and office building.

Glasgow, Ky.—Wholesale Grocery.—B. S. Sweeza will erect frame building; tin roof; 60x50 feet; cost not decided; plans by E. Rayner; contract to be let.

Haskell, Texas.—County Jail.—Haskell county has voted \$30,000 of bonds for erection of proposed county jail. Address County Commissioners.

Hickman Mills, Mo.—Clubhouse.—Automobile Club of Kansas City, Kansas City, Mo., has not engaged architect to prepare plans for clubhouse recently noted to be erected; structure will probably be a bungalow and cost about \$7000; W. W. Cowen, president of club, 307 Board of Trade Bldg., Kansas City, Mo.

Houston, Texas.—Sanitarium.—Baptist Sanitarium, Rev. J. L. Goss president, contemplates expending \$50,000 for enlargements and improvements; bids for excavation work for proposed addition to be opened January 8.

Jacksonville, Fla.—Salvation Army Building.—Salvation Army will soon begin erection of building to contain auditorium, living quarters for officers, hotel for workingmen and facilities for cheap baths; site 35x105 feet; cost about \$15,000.

Johnson City Tenn.—Store Building.—George L. Carter will erect department store and office building to cost \$50,000.

Little Rock, Ark.—Home.—Bids will be opened January 11 for erection of Ada Thompson Memorial Home; certified check, payable to E. G. Thompson, chairman building committee, Little Rock, for \$500; plans and specifications on file at office of Gibbs & Sanders, architect, 225-23 Gazette Bldg., Little Rock.

Memphis, Tenn.—Business Building.—C. J. Wagoner has contract for erecting proposed Hill building; two stories; brick and stone; cost \$30,000; plans by Harker & Cairnes, Memphis.

New Orleans, La.—Garage.—R. C. Perkins awarded contract to Orleans Tile Manufacturing Co., 1634 Washington Ave., New Orleans, for erection of garage; hollow concrete blocks; plans by Hans Hirsch, 1634 Washington Ave., New Orleans.

New Orleans, La.—Building.—John E. King, 835 Exp. boulevard, will erect two-story structure, to cost \$6000; plans by owner; gas and electric lighting; ordinary construction; contract to be awarded.

New Orleans, La.—Garage.—W. H. Bofinger has had plans prepared by DeBrys, Churchill & Labouisse, New Orleans, for garage; two stories; brick; tile roof.

New Orleans, La.—Business Building.—A. H. Geissler has had plans prepared by DeBrys, Churchill & Labouisse, New Orleans, for three-story brick business building.

New Orleans, La.—Store and Dwelling.—Gaspar Trapeil will erect two-story store and dwelling; owner is builder.

Oklahoma City, Okla.—Clubhouse.—John Sinopoule will expend about \$10,000 for remodeling three-story building into clubhouse; contract awarded.

Pulaski, Va.—Store, etc.—S. M. Lyon will erect two-story store and office building; 100x75 feet; ordinary construction; electric lighting; cost \$14,000; plans by J. F. Hall, Pulaski. (See "Machinery Wanted.")

St. Louis, Mo.—Store Building.—Union Housefurnishing Co. has leased store building to be erected at 27th street and Washington avenue by Pemberton Investment Co. of Sixth and Olive Sts., St. Louis; eight stories; 48x150 feet; fireproof; steel columns; reinforced concrete floors; exterior gray vitrified brick of ornate design; building will have its own electric-light and heating plants; compressed-air vacuum cleaning, with piping to every floor; lower floor surrounded by plate-glass windows; two freight and two passenger elevators to be installed; cost of building \$150,000; contract awarded to James Black Masonry & Contracting Co., St. Louis; plans by Eames & Young, St. Louis.

Swansea, S. C.—Drug Store.—J. R. Langford will rebuild drug store recently reported burned at loss of \$3000; brick structure; 25x100 feet.

Tulsa, Okla.—Mercantile Building.—W. H. Nicely had plans prepared by J. V. Starr, Tulsa, for mercantile building recently mentioned; two stories; 40x90 feet; gas and electric lighting; contract to be let; cost about \$15,000.

Washington, D. C.—A. W. Lukel, 1737 DeSales St., awarded contract to Reese F. Lukel, 1334 2d St., Washington, for erection of store and apartment building; 28x105 feet; mill construction; hot-water heat; gas and electric lights; cost about \$22,000.

Washington, D. C.—Sanatorium.—Robert A. Miller of Taggart, Thrift & Co., 1405 New York Ave. N. W., is interested in organization of company to erect sanatorium on Carroll tract in Takoma.

Washington, D. C.—Car Barn.—Capital Traction Co., 36th and M Sts. N. W., will erect addition to car barn on 7th street; site 290x125 feet.

Yokum, Texas.—Lodge Building.—Woodmen of the World organized company with J. E. Lander president and S. S. Stahl secretary, to erect lodge building; brick; 100x100 feet; two stories; cost about \$11,000; lower floor will be storeroom and upper floor lodgeroom and opera-house.

MUNICIPAL BUILDINGS

Albany, Ga.—City Hall.—City's bond issue of about \$80,000 for municipal improvements, previously reported, has become available; present city hall will either be remodeled or new structure erected. Address The Mayor. (See "Road and Street Improvements.")

Baltimore, Md.—Truckhouse.—Following contractors will submit estimates for erection of truckhouse at southeast corner Calvert and Read streets for use of Baltimore City Fire Department: P. J. Cushen & Co., Law Bldg.; R. B. Mason, 324 West Biddle St.; Henry S. Rippel, 1-7 Clay St.; Frederick Decker & Son, 1209-1211 East Biddle St.; James F. Farley, 43 Franklin Bldg.; David M. Andrew Company, 404 Vickers Bldg.; Charles L. Stockhausen, National Marine Bank Bldg.; Joseph Schamberger, 2122 East Baltimore St.; all of Baltimore. Structure will be two stories; frontage on Calvert street about 30 feet; depth about 125 feet; plans by Mottu & White, Professional Bldg., Baltimore; bids to be opened January 6, as recently mentioned.

Bluefield, W. Va.—Fire Station.—Baker & Wells, Graham, W. Va., are lowest bidders at about \$4465 for erection of fire station at Bluefield, recently mentioned; plans by T. T. Carter of Bluefield.

Duncan, Okla.—City Hall.—City has voted \$46,000 of bonds for erection of city hall, etc. (See "Water-works.") Address The Mayor.

Hannibal, Mo.—City Hall.—City will vote January 14 on issuance of \$75,000 of bonds for erection of city hall. Address The Mayor.

St. Louis, Mo.—Insane Asylum, etc.—Board of Public Improvements, A. J. O'Reilly, president, has had plans prepared by Milligan & Wray, 721 Olive St., St. Louis, for insane asylum building; three stories and basement; cost \$65,000; bids to be opened January 15. Other buildings for which proposals will be opened January 15 include engine-house No. 37, \$22,000; engine-house No. 47, \$30,000; Carr Square comfort station, \$16,000; Forest Park foot bridge, \$2500; new stable, etc., Female Hospital, \$5000; new stable, insane asylum, \$1500. Work contemplated for 1909 includes City Hospital extension, \$800,000; City Hospital nurses' quarters, \$55,000; municipal building, 13th and Market streets, \$2,000,000; municipal bridge, \$3,500,000; engine-house No. 48, \$30,000; two other engine-houses, \$40,000; stable, Park Department, \$15,000; band stand for St. Louis place, \$3500; building for Hyde Park, \$3000. (Recently mentioned.)

Texarkana, Texas.—Jail.—City has voted \$5500 of bonds for erection of municipal jail and \$2000 for fire station. Address The Mayor. (Recently mentioned.)

RAILWAY STATIONS

Cuthbert, Ga.—Georgia, Florida & Alabama Ry., J. P. Williams, Savannah, Ga., president, contemplates, it is reported, expending about \$50,000 in improvements at Cuthbert, including erection of passenger station.

Georgetown, Ky.—State Railroad Commission, A. T. Siler, chairman, Frankfort, Ky., will consider drawings and specifications for depot at Georgetown.

Johnson City, Tenn.—George L. Carter will erect depot.

SCHOOLS

Atlanta, Ga.—Bishop C. K. Nelson will erect \$25,000 school for girls.

Duncan, Okla.—City has voted \$46,000 of bonds for erection of two \$10,000 school buildings and city hall and extension of water-works. Address The Mayor.

Heflin, Ala.—Cleburne county will erect \$8000 brick high-school building. Address County Commissioners.

Johnson City, Tenn.—City contemplates issuance of \$50,000 of bonds for erection of high-school building. Address The Mayor.

Kington, Okla.—Kington School District will soon award bids for erection of building for which \$15,000 bonds were recently voted; eight classrooms; auditorium 50x100 feet; architect not named; T. C. Jones, Mayor.

Knoxville, Tenn.—City contemplates issuing \$150,000 of bonds for erecting school building. Address The Mayor.

Newport, Ark.—City is having plans prepared for \$30,000 school building. Address The Mayor.

Midland, Texas.—Plans and bids will be opened by Volney Johnson, secretary of building committee, February 1 for Christian College; brick and stone; cost not over \$35,000.

Oklahoma City, Okla.—City awarded contracts to L. F. Lee, Oklahoma City, at \$17,564 for erection of Putnam Heights School; to Oklahoma Construction Co., Oklahoma City, at \$28,552 for erection of Monte Ne School building, and to Kennedy & Hobson, Tulsa, at \$25,100 for erection of Third ward school building. (Recently mentioned.)

Siloam Springs, Ark.—City will erect two-story eight-room school building. Address The Mayor.

Talladega, Ala.—Talladega College, J. M. P. Metcalf, president, will erect Andrews Theological Hall recently mentioned, also build frame residence and hospital; Frank Lockwood, Montgomery, Ala., prepared plans for hospital; two stories; brick; 40x60 feet; hot-water heat; Otis elevator; cost \$6000; Jans C. Peterson, Traverse City, Mich., is architect for residence; to be of frame; moderate size; hot-air furnace; cost \$2700; architect not yet selected to prepare plans for theological hall; to be large building, with classrooms, office and dormitories; steam heat; cost \$15,000; electric lighting in hall and hospital; buildings not to be erected by contract.

Texarkana, Texas.—City has voted \$125,000 of bonds for erection of high-school building. Address The Mayor. (Recently mentioned.)

Thomson, Ga.—City will open bids February 2 for erection of proposed school building; plans by C. Gadsden Sayre & Co., Anderson, S. C.; structure 67x130 feet; steam heat; electric lighting; plumbing; cost \$30,000 to \$25,000.

Tulsa, Okla.—City awarded contract to Allen Cook, Tulsa, at \$74,000 for erection of Third ward school building; eight rooms; reinforced concrete with Carthage stone trimmings; tile roof; steam heat; gas and electric lights; plans by J. J. Glanfield, Tulsa. (Recently mentioned.)

Washington, D. C.—St. Theresa's Church, Washington and Fillmore Sts., Anacostia, awarded contract to Charles J. Cassidy Company, 523 13th St. N. W., Washington, for erection of parochial building on U street, Anacostia, to contain assembly hall, school-rooms and quarters for Sisters of Notre Dame; three-story brick building; steam heat; gas lighting; cost \$40,000; plans by Julius Wenig, 1223 F St. N. W., Washington.

Washington, D. C.—Thompson-Starrett Company, 700-706 14th St. N. W., Washington, at \$85,300, is lowest bidder for erection of 12-room school building at Garfield;

Henry B. McFarland, Commissioner, Washington. (Recently mentioned.)

Williamsburg, Ky.—City will soon open bids for erection of school building; two stories; brick; about 12 rooms; fireproof; ordinary construction; steam heat; cost about \$15,000; R. L. Pope, secretary School Board, Williamsburg. (\$19,000 bond issue noted in November.)

Woodlawn, P. O. Birmingham, Ala.—City has voted \$15,000 of bonds for school improvements. Address The Mayor. (Recently mentioned.)

Woodsdale, P. O. Wheeling, W. Va.—Ohio county has defeated \$43,000 bond issue for erection of school building at Woodsdale and contemplates voting again on same issue. Address County Commissioners.

THEATERS

Springfield, Mo.—Diemer Theater Co. Incorporated with \$50,000 capital stock by R. C. Stone, James T. Neville and O. C. Price.

WAREHOUSES

Baltimore, Md.—Atlantic Transport Co., James C. Gorman, resident manager, 201 Chamber of Commerce Bldg., will erect corrugated-iron warehouse to replace structure recently burned. (See "Miscellaneous Construction Work.")

Clarksville, Tenn.—Dunlop Milling Co. awarded contract to Hall & Cronan, Dayton, Ohio, for erection of warehouse; three stories; brick and concrete; cost about \$30,000.

Durant, Okla.—D. Head & Son have selected W. A. Stevens of Durant as architect for contemplated warehouse and meal mill to cost about \$6000. (See "Flour, Feed and Meal Mills.")

Kansas City, Mo.—Edward Lonsdale will erect warehouse; one story; 176x135 feet; cost about \$10,000.

Laurel, Miss.—Cudahy Packing Co., Chicago, Ill., is arranging, it is reported, for establishment of distributing warehouse in Laurel. (See "Canning and Packing Plants.")

Memphis, Tenn.—Riechman-Crosby Hardware Co., John Riechman, president, purchased site, 75x200 feet, on which to erect warehouse; four and one-half stories; brick and stone; concrete basement; electric freight and passenger elevators; sprinkler system for fire protection; estimated cost \$75,000.

RAILROAD CONSTRUCTION

RAILWAYS

Aransas Pass, Texas.—Mr. Charles P. Taft of Cincinnati, Ohio, informs the Manufacturers' Record that he is not a stockholder in a railroad company proposing to build from Aransas Pass to Eagle Pass, Texas, and he has no intention of going into any such enterprise. This denies a recent press report.

Altus, Okla.—The Altus, Roswell & El Paso Railway Co. is reported to have let a contract to the Chase Construction Co. of St. Louis. Considerable work has already been done on the road, of which Ed Kennedy is president.

Artemus, Ky.—Construction will, it is reported, be renewed upon the Cumberland Railroad, and the proposed extension to Jellico, Tenn., 27 miles, will be built. Ten miles of line are now in operation and considerable grading has been done on the extension. B. C. Milner is chief engineer and general manager at Warren, Ky.

Augusta, Ga.—Officers of the Charleston & Western Carolina Railway are reported as saying that early in January the tracks along the river which were destroyed by flood will be rebuilt, much of them on trestlework. A. H. Porter is engineer at Augusta, Ga.

Baltimore, Md.—John C. Rose of Baltimore, counsel for Edward Lauterbach of New York, owner of the franchise for the Baltimore & Drum Point Railroad, announces that Mr. Lauterbach will either build the road or negotiate with others who will build it. This is with reference to the extension of time granted.

Birmingham, Ala.—The Manufacturers' Record is informed that the Queenstown Company of Birmingham is going to build a belt road connecting the new town of Queenstown, on the main line of the Seaboard Air Line, 12 miles east of Birmingham, with the Mineral branch of the Louisville & Nashville Railroad and with the Alabama Great Southern Railroad at Trussville, Ala., and also with the Seaboard, the Central of Georgia and the Southern Railway at Leads, Ala. Propositions are desired from responsible contractors. N. F. Thompson is vice-

president and general manager of the Queenstown Company, 2113 First avenue, Birmingham, Ala.

Columbia, Mo.—The North Missouri Central Railway Co. of Columbia, Mo., has been chartered; capital \$600,000. The incorporators are W. C. Carroll, T. F. Whitesides, Turner S. Gordon and others.

Corsicana, Texas.—J. V. Watkins of Corsicana, Texas, and A. M. Collins and W. A. Davis of St. Louis are reported as conferring with Dallas business men on a plan to build an interurban electric railway from Dallas via Waxahachie to Corsicana, with a spur 10 miles long from Waxahachie to Ennis and also from Corsicana to Palestine, Texas. The latter line would be 60 miles long, and the total distance from Dallas to Palestine 117 miles. Mr. Watkins is reported as saying that more than half of the right of way is secured and that money is back of the proposition.

Cuthbert, Ga.—Milam & Wright Bros., railroad contractors, are reported to have camped with forces at Kimbroughs, on the Seaboard Air Line, near Richland, Ga., to begin construction of the reported extension of the Georgia, Florida & Alabama Railway. Another report says that Hall & Parker are the contractors and that they are at work near Benevolence. Two routes out of Cuthbert have been granted by the Mayor and Council. Connection with the Seaboard Air Line is to be near Richland, Ga.

Bartlesville, Okla.—Reported that contracts are being prepared to build an electric interurban railway out of Bartlesville along the grade of the old Jacob Bartles railroad from Bartlesville to Ochelata, 10 miles. The Mayor may be able to give information.

Brownwood, Texas.—L. B. Comer and G. H. Connell of Fort Worth, Texas, have made a proposition to the Brownwood Commercial Club, according to a press report, to build a motor railroad from Brownwood to Rising Star, Texas.

Carriazo Springs, Texas.—J. C. Dennis of Temple, Texas, promoter of the Neuces, Rio Grande & Mexico Railway, and who is a director of the company, is reported as saying that the capitalists back of the line are ready to begin construction. A. M. McElwee of Fort Worth and M. C. Wells of Benbrook, Texas, are mentioned among them. Asher Richardson of Carriazo Springs is president and general manager; J. T. Bivens of Pearsall, Texas, vice-president; E. F. Gaddis of San Antonio, treasurer; W. A. H. Miller of Asherton, general attorney. Other directors are W. W. McKinley of Pearsall, Texas; J. N. and C. L. Crump of Paducah, Texas, and C. T. Nesbitt of San Antonio, Texas. The present line will run from Artesia to Carriazo Springs and Asherton, and may eventually reach Eagle Pass as well as Aransas Pass, 300 miles.

Crockett, Texas.—Smith Bros., contractors, of Crockett, are reported to be grading on the proposed extension of the Texas South-eastern Railroad from Druso to Crockett, 28 miles.

El Paso, Texas.—The San Diego, El Paso & St. Louis Railroad Co. has filed its charter to build a line from El Paso northeast to the boundary of New Mexico and to Crow Springs, in El Paso county, 100 miles; capital \$100,000. A. Courchesne of El Paso, president of the El Paso-Carlsbad Townsite & Development Co., and others are interested; headquarters at El Paso, Texas.

Ellisville, Miss.—Reported that eight miles are completed on the railroad from Ellisville to Kola, Miss., and that a steel bridge has been built over Leaf River. The rest of the construction will be pushed, the line to be altogether 30 miles long. The Ellisville Lumber Co., Mulford Parker, president, is said to be interested.

Etowah, Tenn.—Reported that a railroad company has been organized to build a line from McFarland, Tenn., to Tellico Plains, Tenn., following the valley of Coker Creek to the headwaters and thence along Six-Mile Creek via Wildcat. Preliminary survey has been made.

Jackson, Miss.—The Board of Mayor and Aldermen has refused to grant a franchise for a belt line requested by R. V. Powers, W. Q. Cole and R. L. Bradley.

Jacksonville, Fla.—D. G. Zeigler, chief engineer, is reported as saying that the Suwannee River Electric Power Co. of Jacksonville proposes to let contracts about February 15 for building its proposed railway to connect Jacksonville, Lake City, Live Oak and other points in Florida with Waycross, Valdosta, Tipton and other points in Georgia. W. B. Owen of Jacksonville is president. There are to be four divisions of the railway, each about 75 miles long.

Lake Arthur, La.—The Southern Pacific is

reported to be surveying for building a connecting link on its line near Lake Arthur. A. V. Kellogg of Houston, Texas, is engineer maintenance of way.

Little Rock, Ark.—An official of the Rock Island system informs the Manufacturers' Record that all the work the company intends to do at present at Hot Springs Junction is grading for some future extension.

Marianna, Ark.—Harry N. Pharr of Memphis is reported to have completed surveys for the Marianna, Aubrey & Western Railroad Co., recently chartered to build a line from Marianna via Wister to Aubrey, Ark., nine miles. J. T. Robertson of Marianna, Ark., is president.

McComb, Miss.—The Liberty-White Railroad, it is reported, contemplates extending to Baton Rouge, and construction will begin early in 1909. J. T. Burke is chief engineer at McComb, Miss.

McCreaner, Ark.—John J. Ball is reported to have the contract for the Meto Valley Railway, which is to be built immediately from a point near McCreaner southward 12 miles into timber land in Lonoke county. E. C. Murray and S. M. Savage are among those interested.

Meridian, Miss.—Reported that Armour & Co. of Chicago will build car shops at Meridian to build cars for their refrigerator lines, and considerable trackage will be required. J. Ogden Armour of Chicago can probably give information. P. W. Scott of Meridian is local agent for the firm.

Miami, Fla.—W. W. Prout of Miami, Fla., is reported to have interested capital in New York, Philadelphia and Pittsburg to build a railroad across the State from Miami to Pensacola, Fla.

Miami, Fla.—An officer of the Florida East Coast Railway writes the Manufacturers' Record that the company is resuming construction below Knight's Key, to which point the Key West extension is now completed, and 45 miles remain to finish the line. Much of the roadbed on the latter is already done and much of the remainder will be built by dredging. There will be three bridges, thus: At Knight's Key, 6800 feet; Moser Channel, 7700 feet, and Bahia Honda, 4000 feet; concrete substructure and steel superstructure. All work is to be done by the company; none let to contract. J. C. Meredith of Miami, Fla., is chief engineer.

Mt. Pleasant, Texas.—M. C. Wolfe, manager of the Red Mineral Springs Development Co. of Mt. Pleasant, Texas, is reported as saying that a company will probably be organized this month to build the projected railway from Red Springs to Mt. Pleasant and Pittsburg, Texas, 12 miles. Arrangements will then be made for construction.

Norfolk, Va.—The receivers of the Norfolk & Southern Railway have been authorized by the court to issue the \$1,000,000 of certificates requested, and part of the work to be done includes double-tracking at Norfolk from a connection with the Tidewater Railway; additional yard tracks at Berkeley, Va.; completion of the Pine Town cut-off between Pinetown and Bishop Cross, N. C.; sidetrack at Bayboro, N. C.; additional yard tracks at Newbern, N. C.; additional sidetracks at Farmville and Washington, N. C.; widening embankments on the Raleigh division, and provide additional tracks and completion of the Albemarle Sound bridge. F. L. Nicholson is chief engineer at Norfolk, Va.

Onalaska, Texas.—Reported that the Beaumont & Great Northern Railroad has been sold to a syndicate headed by B. F. Yoakum and that extensions will be made to form a line between Beaumont and either Dallas or Fort Worth. William Carlisle of Atchison, Kans., is president of the road, which is 34 miles long, from Trinity, Texas, via Onalaska to Livingston, Texas. The company has for some time projected an extension from Livingston to Beaumont, Texas, 65 miles. J. A. Clement of Onalaska, Texas, is chief engineer.

Rising Star, Texas.—Engineers are reported to be surveying from Rising Star via Carbon to Eastland, Texas, for a railroad in which residents of Rising Star and also people from Michigan are interested. The Mayor may be able to give information.

Robard, Ky.—The Panama Coal & Coke Co. of Robard, Ky., J. M. Miller, manager, will, it is reported, build an electric tramway from Robard to the Green River, three or four miles.

Stamford, Texas.—The Stamford & Northwestern Railway Co., which proposes to build from Stamford to Plainview, Texas, 165 miles has filed its charter. L. M. Bule of Stamford is president. S. M. Swenson is also reported interested. It is reported that construction will begin immediately on the first section, from Stamford to the Spur

Ranch in Dickens county. J. L. McSpadden of Fort Worth is the contractor. P. G. Burns is chief engineer.

Shawnee, Okla.—Mr. C. J. Benson, general manager, informs the Manufacturers' Record that survey has been made from Shawnee to Muskogee, Okla., for the Shawnee Central Railroad, and that survey will be completed this coming summer from Shawnee to Lawton, Okla. It is hoped to begin construction between Muskogee and Shawnee this year. F. H. Peckham is chief engineer. J. M. Aydelotte is president; J. W. Rubey, vice-president, and S. J. Roys, secretary.

Shreveport, La.—Construction is reported in progress on the Shreveport Northeastern Railroad to connect Shreveport, Minden and Homer, La., 47 miles. Twenty miles between Minden and Homer are graded. F. H. Drake of Minden has been reported interested. T. J. Hardeman of Minden, La., is chief engineer.

Waskom, Texas.—The Missouri, Kansas & Texas Railway, it is reported, has been purchasing right of way for a branch from Waskom south. J. W. Petheram of Dallas, Texas, is chief engineer.

Weatherford, Texas.—Reported that a railroad will be built near or through the Fleming Ranch & Cattle Co.'s lands. D. L. Swearingen of Kansas City, Mo.; S. G. White of Weatherford, Texas, and Dr. J. H. Wilson, chairman of the Texas Live-Stock Sanitary Board, are said to be interested, together with L. C. McBride of Dallas, Texas, and a Mr. Simpson of Quanah, Texas.

Weston, W. Va.—Dr. George I. Keener has been granted a franchise by the court to build an electric railway from Weston to Bendale, W. Va.

Wichita Falls, Texas.—Reported that the Wichita Falls & Northwestern Railway will build an extension of 30 miles from Frederick, Okla., to Altus, Okla., and another extension from Newcastle, Texas, via Graham to Llano, Texas. R. A. Thompson is chief engineer at Wichita Falls, Texas.

STREET RAILWAYS

Birmingham, Ala.—Reported that contracts will soon be let for the Birmingham & Shades Mountain Electric Railway, five miles long, previously reported. G. T. Brazelton and others are interested. Ohl & Totten, 103 North 20th street, Birmingham, Ala., are the engineers.

Georgetown, S. C.—The Georgetown Electric Street Railway Co. and the City Council are reported to have reached an agreement for the franchise of the company, and stock subscription books are to be opened January 25. H. C. Case and S. C. Case of Philadelphia, Pa., are the incorporators.

Goldsboro, N. C.—Construction is reported begun on the Goldsboro Electric Street Railway. E. T. Oliver is general manager.

Hobart, Okla.—The Hobart Motor Railroad Co. is reported to have reorganized and will soon build an electric railway. H. H. Hoover is president; C. Townsend Blake, vice-president; J. H. Montgomery, secretary; R. E. Nye, treasurer. W. T. Croslen of Chickasha, Okla., is also a director. Mr. Blake is of New York; the others are local parties.

Rome, Ga.—The Rome Railway & Light Co. has authorized a new issue of \$250,000 of bonds, and it contemplates extensions in Rome and also from Lindale to Boozeville.

MACHINERY, PROPOSALS AND SUPPLIES WANTED

Manufacturers and others in need of machinery of any kind are requested to consult our advertising columns, and if they cannot find just what they wish, if they will send us particulars as to the kind of machinery needed we will make their wants known free of cost, and in this way secure the attention of machinery manufacturers throughout the country. The Manufacturers' Record has received during the week the following particulars as to machinery that is wanted.

Air Compressor.—Independent Ice Co., Nashville, Tenn., wants prices on air compressor.

Air Compressor.—J. B. Winslett, City Secretary, Dallas, Texas, will receive bids until January 15 for furnishing one air compressor, to be duplex with compound steam and two-stage air cylinders, and to be designed that it may run either condensing or non-condensing as required; compressor shall be

capable of furnishing not less than 700 cubic feet of free air per minute against gauge pressure of 100 pounds with steam pressure of from 80 to 100 pounds; specifications on file in office of Mr. Winslett, copy of which can be had on application; said compressor to be delivered f. o. b. Dallas, Texas; certified check, \$300.

Boiler.—Edward Helb, Railroad, Pa., wants new or second-hand 15-horse-power boiler, delivered Shrewsbury Station, Pa.

Boiler.—See "Water-works Equipment."

Boiler, etc.—Baltimore (Md.) Board of Awards will receive bids at office of J. Sewell Thomas, City Register, City Hall, until January 13 for furnishing and installing boiler, blow-off tank, etc., at Walters' Bath No. 3, at 1018-1022 Argyle avenue, for use of Free Bath Commission of Baltimore; certified check, \$500; plans and specifications at office of Edward D. Preston, Building Inspector, City Hall.

Bolts.—Hale & Bitting, 2 Chamberlain Bldg., Chattanooga, Tenn., want prices on one-half-inch bolts; different lengths; nuts and washers on both ends.

Brick.—S. M. Lyon, Pulaski, Va., wants 24 cars brick. (See "Building Materials.")

Bridge Construction.—Contracts will be awarded March 4 at courthouse, Paris, Ark., for construction of following bridges: Over Sugar Creek at Elm Scott Ford, S. A. Fennel, Sugar Grove, Ark., and A. J. Knox, Booneville, Ark., Commissioners; over Petit Jean at Lucas Ford, W. H. Tyler and J. F. Wade, Lucas, Ark., Commissioners; over Scott Creek at Frank Scott Ford, J. G. Taylor, Magazine, Ark., and H. M. Westmoreland, Booneville, Ark., Commissioners; over Cane Creek between Prairie View and Morrison Bluff, T. J. Pistle and A. L. Gray, Prairie View, Ark., Commissioners; two bridges, one over Mill Creek and one over Little Shoal Creek at Blaine Fords, George R. Brown and W. F. Houser, Blaine, Ark., Commissioners. Structures to be standard steel and iron bridges and completed by October 30, 1909; blueprints, etc., on file in office of Fred N. Carter, County Clerk, Paris; J. W. Castleberry, County Judge.

Bridge Construction.—W. W. Miller, clerk of Washington county, Greenville, Miss., will receive bids until January 4 for construction of steel bridge 150 feet long across Jackson Bayou near Isola, Miss.; bids to be in accordance with plans and specifications on file in Chancery Clerk's office.

Bridge Construction.—Bids will be received at United States Engineer Office, Wilmington, N. C., until January 30 for constructing steel draw-span highway bridge, with pile and concrete foundations, on Core Creek, near Beaufort, N. C. Information on application. Earl I. Brown, City Engineer.

Builders' Supplies.—W. W. Stevenson, 214 Burns Ave., Winchester, Ky., wants prices on builders' supplies.

Building Materials, etc.—J. A. Apperson, Douglas, Ga., wants estimates on sheet-metal work, stone and marble, terrazzo floors, plastering, painting, plumbing, heating, electrical work, ornamental and structural terra-cotta, sash, doors and trimmings and tile roofing for U. S. postoffice, Gainesville, Fla.

Building Materials.—S. M. Lyon, Pulaski, Va., in market for 2 cars No. 1 flooring, 24 cars brick, 1 car James River cement, 75 squares (good) tin roofing, 75 squares steel ceiling, 4 store fronts (glass, etc.), 100 feet steel girders, patent plastering, doors, windows, etc.; immediate shipment, f. o. b. cars, Pulaski.

Canning Machinery.—Henry A. Page, Jr., Aberdeen, N. C., wants information and prices on canning machinery.

Chewing-gum Machinery.—Geo. M. Crews, Kernersville, N. C., wants data and prices on machinery for manufacturing chewing-gum.

Concentrating Machinery.—See "Crushing and Concentrating Machinery."

Concrete-block Machinery.—Van Tyne Pritchard, Waldron, Kans., wants to correspond with manufacturers of and dealers in machinery for concrete-block plant.

Corn Mill.—J. W. Bell, Spartanburg, S. C., wants three-pair high-roller corn mill, 9x30 or 9x24; second-hand preferred.

Cotton Gin.—W. H. Nix, Box 127, Clayton, Ala., will want 4 70-saw gin; engine and boiler supplied.

Crushing and Concentrating Machinery.—Van Tyne Pritchard, Waldron, Kans., wants to correspond with manufacturers of and dealers in machinery for crushing and concentrating manganese ores.

Electric Fixtures.—Grenada Bank, Grenada, Miss., wants prices on electric fixtures for two-story bank and office building.

Electric Machinery.—See "Motors, etc."

Electric Machinery.—National Machinery & Wrecking Co., 1914 Scranton Road, Cleveland, Ohio, wants to buy 100-kilowatt, 250 volt, belted, direct-current, standard-make generator; state condition, price and full particulars, first letter.

Electric Motor.—See "Power Plant."

Electrical Machinery.—See "Power Plant."

Electric Wiring and Fixtures.—Bids will be opened January 13 for electric wiring and fixtures for proposed Wesley Memorial Church building, Atlanta, Ga. George C. Thompson, 1230 Candler Bldg., Atlanta, Ga., is architect. (See "Churches.")

Electrical Work.—J. A. Apperson, Douglas, Ga., wants prices on electrical work. (See "Building Materials, etc.")

Elevators.—Bids will be opened January 13 for elevators for proposed Wesley Memorial Church building, Atlanta, Ga. George C. Thompson, 1230 Candler Bldg., Atlanta, Ga., is architect. (See "Churches.")

Engine.—Edward Helb, Railroad, Pa., wants 10-horse-power new or second-hand engine, delivered Shrewsbury Station, Pa.

Engines.—See "Gasoline Engines."

Engine.—Pearsall Gin Co., Pearsall, Texas, wants 14x36 Corliss engine or 14x18 or 20 automatic engine, to operate cotton ginny.

Engines.—See "Power Plant."

Engines.—M. H. Hightower, Hogansville, Ga., wants addresses of dealers in second-hand engines.

Flour Mill.—C. W. Mann, Evinston, Va., will need 7x12-foot overshot water-wheel, two run of buhrs, and machinery for 30 to 40-barrel flour mill.

Flooring.—S. M. Lyon, Pulaski, Va., wants two cars No. 1 flooring. (See "Building Materials.")

Flour Mill.—J. C. Smith, Bixley, N. C., wants to correspond with manufacturers of flour-mill equipments.

Gasoline Engines.—See "Power Plant."

Gasoline Engines.—Needwood Forest Specialty Farm, Burkittsville, Md., wants catalogues and prices on gasoline and other liquid fuel engines.

Handle Machinery.—See "Woodworking Machinery."

Hardware.—J. Bert & Co., 20 Rue Sofia, Pera, Constantinople, Turkey, want to correspond with American manufacturers of hardware.

Heaters.—W. W. Stevenson, 214 Burns Ave., Winchester, Ky., wants prices on heaters for small dwellings.

Heating and Ventilating.—Bids will be opened January 13 for heating and ventilating proposed Wesley Memorial Church building, Atlanta, Ga. George C. Thompson, architect, 1230 Candler Bldg., Atlanta, Ga. (See "Churches.")

Heating Plant.—J. A. Apperson, Douglas, Ga., wants prices on heating plant. (See "Building Materials, etc.")

Heating Plant.—Grenada Bank, Grenada, Miss., wants prices on heating plant for two-story bank and office building.

Household Novelties.—Stimpson, Davids & Co., 8 South St., Finsbury, London, E. C., England, want catalogues, prices, discounts, etc., on American household novelties.

Iron Front.—W. F. Dutton, Brady, Texas, wants prices on iron front for store building.

Locomotive.—Dekle Investment Co., Tampa, Fla., wants 25 to 30-ton locomotive.

Logging Trucks.—Dekle Investment Co., Tampa, Fla., wants logging trucks.

Mantels.—W. W. Stevenson, 214 Burns Ave., Winchester, Ky., wants prices on mantels.

Metals.—J. Bert & Co., 20 Rue Sofia, Pera, Constantinople, Turkey, want to correspond with American manufacturers of tin, sheet iron, copper, galvanized iron, etc.

Mining Machinery.—See "Crushing and Concentrating Machinery."

Miscellaneous Supplies.—Bids will be received at office of General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until January 25 for furnishing steel, iron, castings, chain, wire rope, exhaust heads, etc. Blanks and general information relating to Circular No. 487 may be obtained at above office or offices of assistant purchasing agents, 24 State St., New York; Custom-house, New Orleans; 1086 North Point St., San Francisco, Cal.; also from U. S. Engineer office in following cities: Seattle, Wash.; Los Angeles, Cal.; Baltimore, Philadelphia, Pittsburg, Boston, Buffalo, Cleveland, Cincinnati, St. Paul, Detroit, Milwaukee, Chicago, St. Louis, Chattanooga, Louisville, Mobile and Galveston; Commercial Club, Kansas City; Chamber of Commerce, Quincy, Ill.; Chamber of Commerce and Board of Trade, Tacoma, Wash.; F. C. Boggs, Captain, Corps of Engineers, U. S. A., General Purchasing Officer.

Motors, etc.—M. H. Hightower, Hogansville, Ga., wants addresses of dealers in motors, etc.

Naval Supplies.—Proposals will be received at Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until January 12 to furnish at navy-yard, Washington, D. C., quantity of naval supplies as follows: Schedule 777—Steel bars, steel roofing. Schedule 778—Portland cement, concrete sand, broken stone, mortar, red bricks, roofing felt. Schedule 779—Pine piles, yellow pine, trolley track rail. Applications for proposals should designate schedules desired by number. Blank proposals furnished upon application to bureau. E. B. Rogers, Paymaster-General, U. S. N.

Oil.—Lynchburg Glove & Mitten Co., Lynchburg, Va., wants oil that, when boiled, can be rolled in sheets and be tough and pliable.

Paving.—Bids will be received at Mayor's office, Benwood, W. Va., until January 12 for paving 3000 yards with either brick or blocks. Plans and specifications on file at Mayor's office, Benwood, or of C. C. Smith, City Engineer of Wheeling, W. Va. John Blake, chairman of committee.

Piping.—See "Water-works Equipment."

Pump.—See "Water-works Equipment."

Planing Mill.—William Lyles Lumber Co., Sparta, Tenn., wants planing-mill equipment.

Plumbing and Drainage.—Bids will be opened January 13 for heating and ventilating proposed Wesley Memorial Church building, Atlanta, Ga. George C. Thompson, 1230 Candler Bldg., Atlanta, Ga., is architect. (See "Churches.")

Plumbing and Drainage.—Bids will be opened January 13 for plumbing and drainage for proposed Wesley Memorial Church building, Atlanta, Ga. George C. Thompson, 1230 Candler Bldg., Atlanta, Ga., is architect. (See "Churches.")

Plumbing and Steam-Fitting Supplies.—Maynard-Crutchfield Company, Winston-Salem, N. C., wants prices on plumbing and steam-fitting supplies.

Power Plant.—C. J. Rose, Miami, Fla., will be in market for steam, gasoline or electric-motor power plant to drive presses, etc.

Pump.—J. H. Dingle, City Engineer, Charleston, S. C., will receive bids until January 20, 1909, for one 450-gallon-per-minute vertical centrifugal pump, with electric motor for operating same. Additional information can be obtained from Mr. Dingle.

Pumps.—Needwood Forest Specialty Farm, Burkittsville, Md., wants catalogues, information and prices on centrifugal compressed-air rotary pumps for hard-water well; 34 feet to bottom of well; 3 1/2 feet to water line (top).

Pump.—City of Muskogee, Okla., will receive bids for 5,000,000-gallon centrifugal pump; specifications obtained on application to L. B. Kinsey, City Engineer.

Pump.—City of Tulsa, Okla., wants pump of 3,000,000 or 4,000,000 gallons capacity; T. C. Hughes, Engineer; W. E. Rohde, Mayor.

Pumping Machinery.—Independent Ice Co., Nashville, Tenn., wants prices on pumping machinery to be operated by compressed air.

Rails.—Dekle Investment Co., Tampa, Fla., wants from three to five miles of rail, 30 to 40 pounds, for logging.

Rails.—Kentucky & Ohio River Interurban Railroad Co., Paducah, Ky., will be in market for about 3000 tons 60-pound relaying rails.

Roofing.—William Lyles Lumber Co., Sparta, Tenn., wants roofing.

Roofing or Skylight.—Lynchburg Glove & Mitten Co., Lynchburg, Va., wants addresses of manufacturers of roofing made of wire screen coated with transparent compound.

Roofing.—S. M. Lyon, Pulaski, Va., wants 75 squares tin roofing. (See "Building Materials.")

Sawmill.—Dekle Investment Co., Tampa, Fla., wants complete sawmill equipment for plant of 25,000 feet daily capacity, flooring and timber machines, etc.

Sawmill.—C. W. Mann, Evinston, Va., wants prices on sawmill equipment.

Sewing Machines.—Edward Helb, Railroad, Pa., wants new or second-hand sewing machines; one buttonhole machine; one button sewer; two special filling; two two-needle machines for sleeve; 21 sewing machines; also shafting and pulleys; quote best price delivered Shrewsbury Station, Pa.

Shafting and Pulleys.—Edward Helb, Railroad, Pa., wants shafting and pulleys. (See "Sewing Machines.")

Shingle Machine.—William Lyles Lumber Co., Sparta, Tenn., wants shingle machine.

Shuttle.—L. D. Holt, 58 St. Michael St., Mobile, Ala., wants names of shuttle manufacturers.

Stationery.—Frank Wright, Cave Springs, Ga., wants plain blank stock certificates, seal and record book.

Steel Girders and Ceiling.—S. M. Lyon, Pulaski, Va., wants 100 feet steel girders and 75 squares steel ceiling. (See "Building Materials.")

Telephone Equipment.—J. I. Gillespie, Box 585, Tulsa, Okla., wants prices on equipment for telephone system.

Tile.—Grenada Bank, Grenada, Miss., wants prices on tile.

Trucks.—See "Logging Trucks."

Watch Materials.—J. H. Beers, Cataula, Ga., wants to buy watch materials.

Water-wheel.—C. W. Mann, Evinston, Va., wants prices on 7x12-foot overshot water-wheel. (See "Flour Mill.")

Water-works Equipment.—City of Seymour, Texas, will receive bids until January 19 for purchase of material necessary in construction of water-works system, consisting of

INDUSTRIAL NEWS OF INTEREST

Manufacturing Plant for Sale.

The plant of the Blackinton Manufacturing Co., near North Adams, Mass., will be offered for sale on January 12. It comprises lands, buildings, power-house, machinery, etc., for manufacturing woolen worsted. An illustrated descriptive catalogue can be obtained by addressing the auctioneers, J. E. Conant & Co. of Lowell, Mass.

New Crane Equipments.

The crane equipment for the improvements in the plant of H. Brewer & Co., Tecumseh, Mich., consists of two eight-ton 30-foot cranes, two five-ton cranes, one eight-ton pillar crane, and several trolleys and hoists for overhead I-beam track. The equipment is being furnished by the Northern Engineering Works, Detroit, Mich.

Old Dominion Portland Cement.

An important consumption of Portland cement was that for building the dam and power of the Greenville-Carolina Power Co. at Greenville, S. C. Several thousand barrels of cement were required, and the Old Dominion brand was selected by the engineers and contractors. This cement is sold by the Wm. G. Hartman Cement Co., Real Estate Trust Bldg., Philadelphia, Pa.

Minneapolis Company's Dallas Office.

The Minneapolis (Minn.) Steel & Machinery Co. has moved its offices at Dallas, Texas, from 147 South Akard street to 801 Praetorian Building, J. P. Greenwood being in charge as Southern representative. This company is well known as engineer and manufacturer of Twin City Corliss engines, Munsel gas engines, power gas-producers, complete power plants, transmission machinery, coal-handling and ore-conveying devices, etc.

Ten Big Sewage Pumps.

The city of Grand Rapids, Mich., has contracted for 10 big sewage pumps with a capacity, under maximum conditions, of over 250,000 gallons per minute. These pumps are to be placed in four stations; two 18-inch pumps, two 24-inch, two 24-inch and four 40-inch. Without motors these pumps will weigh about 200,000 pounds. The Buffalo Steam Pump Co. of Buffalo, N. Y., has the contract for the pumps, and the Westinghouse Electric & Manufacturing Co. of Pittsburgh, Pa., has the contract for the electrical equipment.

Maurice Thomas With Whitted & Co.

Maurice Thomas, for many years manager of the Westinghouse Electric and Manufacturing Co. offices at New Orleans, and later manager for the Allis Chalmers Company at Atlanta, Ga., has become identified with Thomas B. Whitted & Co., contracting engineers, Charlotte, N. C. This company is making a specialty of steam, electric and hydraulic power plants and is selling machinery and supplies of all kinds. Mr. Thomas will be manager of the company's Atlanta office, in the Candler Building, and will be in general charge of its affairs in that district.

Berger Salesmen's Annual Convention

The annual convention of the salesmen of the Berger Mfg. Co., sheet-metal specialists, Canton, Ohio, was held last week. Eighty-two men connected with the sales department were present, including 32 from the home offices, the remainder being branch managers and salesmen with headquarters in New York, Minneapolis, Chicago, St. Louis, Atlanta, Boston and Philadelphia. A. T. Enlow, manager of the sales department,

return tubular boiler, duplex pump, cast-iron pipe, fire hydrants and valves. Specifications may be had by addressing O'Neil Engineering Co., Dallas, Texas.

Wire.—Hale & Bitting, 2 Chamberlain Bldg., Chattanooga, Tenn., want prices on screen wire of different sizes.

Woodworking Machinery.—Frank Wright, Cave Springs, Ga., wants universal saw bench or woodworker.

Woodworking Machinery.—William Lyles Lumber Co., Sparta, Tenn., wants column-boring machine.

Woodworking Machinery.—Buena Vista Hardwood Co., Stoney Bottom, W. Va., wants machinery to manufacture insular pins and brackets; also handle machinery.

Woodworking Machinery.—L. D. Holt, 58 St. Michael St., Mobile, Ala., wants names of manufacturers of machinery for making spools for thread, bucket handles and file and chisel handles.

addressed the convention on sales efficiency for 1909 and urged the men to improve next year their efforts of 1908, when practically every salesman exceeded his record for the previous year. George J. Smith spoke on roofing, siding, cornices, ventilators, etc. H. L. McKenzie spoke on jobbing lines of eaves, troughs and conductor pipes. Mr. Enlow spoke on the sale of sheet steel.

The L. E. Jones Ornamental Metal Work.

Messrs. L. E. Jones & Co., 321 N. Calvert St., Baltimore, Md., are manufacturers of all kinds of wrought-iron railings, wire, iron and brass work, their specialty being elevator cars and enclosures. Since 1900, when it was established, this firm has established a large and lucrative business in the South and has maintained its good record during the past year, in spite of the general depression. Among the articles Jones & Co. manufacture are wire signs, wire cloth for all purposes, bank and office railings and screens, tool-room enclosures, brass railings, wire lathing, door grilles, window guards, coal and sand screens and folding gates. The firm proposes to expend considerable effort during 1909 to secure Southern trade, and will furnish catalogues on request.

Thor Tools on the Stage.

That the importance of pneumatic tools is now more generally recognized by the public at large than ever before is shown by the use of Thor hammers in "Via Wireless" at the Liberty Theater, New York. The plot revolves about the overtempering of a huge experimental gun so that it will explode under test and throw a large Government contract for another gun to the steel works holding patents on the second gun. The second act discloses a reproduction of the forgeroom of one of the largest steel plants in the country. Each side of the stage shows a row of furnaces, from which large billets of white-hot steel are carried on overhead trolleys to the immense steam hammers in the center of the stage and forged into shape. During the action the heavy thud and vibration of the steam hammers and the rapid blows of the Thor pneumatic hammers show that the shop forces work on unconscious of the villainy of the higher officials. Just before the curtain falls the much overheated gun forging is swung across the stage and dropped with a hiss and a cloud of vapor into the tempering bath. The Independent Pneumatic Tool Co., Chicago, manufactures the Thor tools.

B. MacKenzie of Greensboro.

B. MacKenzie, steam and hot-water engineer, Greensboro, N. C., has developed an extensive trade in the South during the seven years he has been in business. His showrooms contain models of all kinds of steam and hot-water boilers, radiators and apparatus, the rear of the first floor being separated from the front by a fence and door uniquely constructed from the piping used in the installation of heating plants. Among many contracts completed by Mr. MacKenzie were: Nine buildings of State Normal and Industrial School, Greensboro, heated from a central power plant and having about 50,000 feet of radiation; all buildings of Agricultural and Mechanical College at Raleigh, N. C., heated from a central plant, with about 35,000 feet of radiation; Baptist Orphanage, Salem, Va., heated by central heating plant; Young Men's Christian Association building, Danville, Va.; First National Bank and school buildings, Marion, Va.; Matt J. Heyer office building and Independent Order Odd

[Continued on Page 165.]

PROPOSALS INVITED FOR CONSTRUCTION WORK.

Details regarding construction work, proposals invited, etc., noted in the following list, will be found in this and recent issues of the MANUFACTURERS' RECORD and the DAILY BULLETIN OF THE MANUFACTURERS' RECORD.

This list includes only items containing specifications for bids. Many additional opportunities for construction and machinery contracts can be noted in the Construction Department.

* Indicates that the item has appeared in our "Machinery, Proposals and Supplies Wanted" department.

Date to open bids.
(When date is
not given it has
not been fixed.)

BRIDGES, CULVERTS, VIADUCTS.

Date to open bids.	Published in— Daily Bulletin.	Manu- facturers' Record.
Jan. 1	Mena, Ark.	Oct. 17 Oct. 22
	*Concrete Steel Bridge, Takoma Park, Md.	Oct. 29 Nov. 5
	*Six Steel Bridges, Abbeville, S. C.	Nov. 5 Nov. 12
	*Culverts, Barton Heights, Va.	Dec. 1 Dec. 3
	Concrete Viaduct, Houston, Texas.	Dec. 7 Dec. 10
Jan. 12	*Steel Bridge, Augusta, Ga.	Dec. 11 Dec. 17
	Five Bridges, Dallas, Texas.	Dec. 15 Dec. 17
Mar. 4	*Six Bridges, Paris, Ark.	Dec. 19 Dec. 24
Jan. 9	*Steel, Sulphur, Okla.	Dec. 24 Dec. 31
Jan. 15	Foot Bridge, St. Louis, Mo.	Dec. 26 Dec. 31

ELECTRIC LIGHT AND POWER PLANTS.

	*Bristol, Tenn.	Nov. 2 Nov. 5
	Chillicothe, Mo.	Dec. 4 Dec. 10
	*Norcross, Ga.	Dec. 7 Dec. 10
	*Water-power-electric Development, White Spring, Fla.	Dec. 8 Dec. 10
Jan. 19	*Municipal Plant, East Point, Ga.	Dec. 22 Dec. 24

MISCELLANEOUS CONSTRUCTION WORK.

	*Levee Work, Waco, Texas.	Nov. 13 Nov. 19
	Wharves, New Orleans, La.	Dec. 5 Dec. 10
	*Heating Plant, Sumter, S. C.	Dec. 8 Dec. 10

ROAD AND STREET IMPROVEMENTS.

	*Vitrified Brick, etc., Ashland, Ky.	*Oct. 30 Nov. 5
	Vitrified Brick, Ada, Okla.	Dec. 7 Dec. 10
	Macadam Roads, Durham, N. C.	Dec. 10 Dec. 17
Feb. 1	Brick Paving, etc., Clinton, Mo.	Dec. 11 Dec. 17
	Boulevard, Anniston, Ala.	Dec. 17 Dec. 24
Jan. 12	*Macadamized Road, Rockyville, Md.	Dec. 21 Dec. 24
Jan. 18	Concrete Sidewalks, Pensacola, Fla.	Dec. 23 Dec. 24
Jan. 12	*Street Paving, St. Louis, Mo.	Dec. 26 Dec. 31
Jan. 19	*Brick, Asphalt, etc., Huntsville, Ala.	Dec. 28 Dec. 31
Jan. 18	*Concrete Sidewalks, Pensacola, Fla.	Dec. 28 Dec. 31
Jan. 12	*Bricks or Blocks, Benwood, W. Va.	Jan. 5 Jan. 7

SEWER CONSTRUCTION.

	*Sanitary Sewers, Winston, N. C.	Sept. 19 Sept. 24
	*Drainage, etc., San Antonio, Texas.	Oct. 23 Oct. 29
	Sewer System Surveys, Clinton, S. C.	Dec. 8 Dec. 10
	Municipal System, Seymour, Texas.	Dec. 7 Dec. 10
	Sewers, Park, Tenn.	Dec. 11 Dec. 17
	Sanitary Sewer, Oklahoma City, Okla.	Dec. 18 Dec. 24
	District Sewers, Park, Tenn.	Dec. 21 Dec. 24
Jan. 19	*Municipal Sewerage, East Point, Ga.	Dec. 22 Dec. 24
Mar.	Storm Drainage, Mobile, Ala.	Dec. 24 Dec. 31
Jan. 11	*Municipal System, Park, Tenn.	Dec. 26 Dec. 31

WATER-WORKS.

	*System, Marcelline, Mo.	Sept. 21 Sept. 24
	*Municipal System, Uniontown, Ky.	Nov. 19 Nov. 26
Feb. 1	Municipal System, Osceola, Ark.	Dec. 4 Dec. 10
	Municipal System, Seymour, Texas.	Dec. 7 Dec. 10
	Water Mains, Huntsville, Ala.	Dec. 8 Dec. 10
Jan. 19	*Municipal System, East Point, Ga.	Dec. 22 Dec. 24
Jan. 25	*Municipal Plant, Daytona, Fla.	Dec. 29 Dec. 31
Jan. 19	*Seymour, Texas.	Jan. 5 Jan. 7

APARTMENT-HOUSES.

	Herbert E. Green, Baltimore, Md.	Dec. 24 Dec. 31
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BANK AND OFFICE BUILDINGS.

	National City Bank, Birmingham, Ala.	July 28 July 30
	First National Bank, Coeburn, Va.	Aug. 12 Aug. 13
Feb.	Middletown Savings Bank, Middletown, Md.	Aug. 24 Aug. 27
	C. P. McKinney, Ripley, Tenn.	Oct. 29 Nov. 5
Jan.	E. P. Ansley, Atlanta, Ga.	Nov. 9 Nov. 12
	Manhattan Sav. Bank & Trust Co., Memphis, Tenn.	Nov. 11 Nov. 12
	Southern Life Insurance Co., Fayette, N. C.	Nov. 21 Nov. 26
	First National Bank, Hendersonville, N. C.	Nov. 19 Nov. 26
	Whitney Central National Bank, New Orleans, La.	Nov. 25 Dec. 3
	Guarantee Trust & Banking Co., Atlanta, Ga.	Nov. 27 Dec. 3
	Franklin Savings Bank, Frederick, Md.	Nov. 30 Dec. 3
	First National Bank, Roanoke, Va.	Dec. 15 Dec. 17
	P. H. Swearingen, San Antonio, Texas.	Dec. 16 Dec. 17
Jan. 21	Southern Life Insurance Co., Fayetteville, N. C.	Dec. 31 Jan. 7

CHURCHES.

	First Baptist Church, Paris, Ky.	July 13 July 16
	Hopkinsville, Ky.	Aug. 19 Aug. 20
	Green Cove Springs, Fla.	Sept. 22 Sept. 24
	Presbyterian Church, Whitman, Ga.	Nov. 2 Nov. 5
Feb.	Gillespie Avenue Baptist Church, Knoxville, Tenn.	Dec. 3 Dec. 10
Mar. 1	Conway, Ark.	Dec. 19 Dec. 24
Jan. 15	Big Springs, Texas.	Dec. 23 Dec. 24
Jan. 9	Central Baptist Church, Chattanooga, Tenn.	Dec. 26 Dec. 31
	Presbyterian Church, Gainesville, Texas.	Dec. 29 Dec. 31
Jan. 13	Wesley Memorial Church, Atlanta, Ga.	Jan. 4 Jan. 7
Mar. 1	M. E. Church, Okmulgee, Okla.	Jan. 5 Jan. 7

COURTHOUSES.

	Martinsburg, W. Va.	July 15 July 16
	Additions, Towson, Md.	Dec. 4 Dec. 10
Mar. 15	Fitzgerald, Ga.	Dec. 22 Dec. 24
Jan. 14	Towson, Md.	Jan. 4 Jan. 7

Date to open bids.
(When date is
not given it has
not been fixed.)

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Manu-
facturers' Record.

GOVERNMENT AND STATE BUILDINGS.

	U. S. Postoffice, etc., Newbern, N. C.	Nov. 28 Dec. 3
Jan. 23	U. S. Postoffice, etc., Anderson, S. C.	Dec. 17 Dec. 24
Jan. 9	Extensions, Navy-yard, Washington.	Dec. 17 Dec. 24
Jan. 9	Storehouse, Naval Station, Key West, Fla.	Dec. 18 Dec. 24
Feb. 1	U. S. Postoffice, Fayetteville, Ark.	Dec. 22 Dec. 24
	Barracks, Fort Moultrie, S. C.	Dec. 4 Dec. 10
Jan. 9	U. S. Postoffice, Murfreesboro, Tenn.	Dec. 7 Dec. 10
Jan. 11	U. S. Postoffice, Gainesville, Ga.	Dec. 8 Dec. 10
Jan. 13	Repairs U. S. Mint, New Orleans, La.	Dec. 24 Dec. 31
Feb. 4	U. S. Postoffice, San Antonio, Texas.	Dec. 28 Dec. 31

HOTELS.

	Coleman-Fulton Pasture Co., Gregory, Texas.	Sept. 9 Sept. 10
	Beeville, Texas.	Nov. 25 Dec. 3
	Corpus Christi, Texas.	Nov. 25 Dec. 3

MISCELLANEOUS STRUCTURES.

	Infirmity, Catlettsburg, Ky.	Oct. 21 Oct. 22
	County Home, Independence, Mo.	Dec. 7 Dec. 10
	Jail, Waycross, Ga.	Dec. 22 Dec. 24
	Clubhouse, Harrisburg, Texas.	Dec. 23 Dec. 24
Mar. 1	Jail, Fitzgerald, Ga.	Dec. 24 Dec. 31
Jan. 25	Memorial Home, Little Rock, Ark.	Jan. 5 Jan. 7

MUNICIPAL BUILDINGS.

	City Stockade, Tampa, Fla.	Nov. 9 Nov. 12
	Police Station, Anacostia, D. C.	Dec. 1 Dec. 3
Jan. 28	Engine-house, St. Louis, Mo.	Dec. 26 Dec. 31
Jan. 29	Comfort Station, St. Louis, Mo.	Dec. 26 Dec. 31
Jan. 15	Stable, St. Louis, Mo.	Dec. 26 Dec. 31

SCHOOLS.

Jan.	Nixon, Texas.	Sept. 23 Sept. 24
	Hartshorne, Okla.	Nov. 28 Dec. 3
Jan. 8	Iva, S. C.	Dec. 11 Dec. 17
Jan. 8	Stillwater, Okla.	Dec. 14 Dec. 17
Jan. 8	Dormitory, Stillwater, Okla.	Dec. 21 Dec. 24
Mar. 1	College Building, Stillwater, Okla.	Dec. 21 Dec. 24
Mar.	Moorhead, Miss.	Dec. 22 Dec. 24
Jan. 12	Richmond, Va.	Dec. 22 Dec. 24
Feb. 2	Thomas, Ga.	Jan. 4 Jan. 7
Feb. 1	Williamsburg, Ky.	Jan. 4 Jan. 7
	Plans and Bids, Midland, Texas.	Jan. 5 Jan. 7

THEATERS.

Feb. 1	Dugan & Nephew, Baltimore, Md.	Dec. 24 Dec. 31
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WAREHOUSES.

	State Warehouse, Baltimore, Md.	Dec. 15 Dec. 17
Feb. 25	Reinforced Concrete Structure, New Orleans, La.	Dec. 23 Dec. 24

[Continued from Page 167.]

Fellows' building, Wilmington, N. C.; Guilford College building, Guilford College, N. C.; Watts Hospital and Durham postoffice, Durham, N. C.; Guilford-Bendow and McAdoo hotels, Greensboro, N. C.; Elwood Hotel, North Carolina Trust & Savings Bank building and Redding office building, High Point, N. C.; Central Hotel, Young Men's Christian Association building and Stone-wall Hotel, Charlotte, N. C.; Central Hotel and Southern passenger station, Salisbury, N. C. Mr. MacKenzie has had wide experience, and with the large force of men he employs, is well equipped to complete intricate and large contracts.

The Industrial Instrument Co.

The Industrial Instrument Co. (Incorporated with a capital stock of \$2,000,000) owns the capital stock of the Standard Gauge Manufacturing Co., until recently of Syracuse, N. Y., and of the Standard Electric Time Co., Waterbury, Conn. Its plans involve the development of an extensive line of those types of measuring instruments and apparatus the use of which promotes directly or indirectly the safety and economy of operation in industrial plants, and oftentimes makes possible operations which without such instruments would be impossible. A decided advantage will be that the buyer is able to secure a certain distinct class of apparatus from one company and know that the component parts will harmonize. Thus the purchaser is relieved of the inconvenience of securing parts from different makers and of the responsibility and forethought necessary to insure their successful operation as a whole. The Standard Gauge Manufacturing Co. will be reincorporated and located at Foxboro, Mass., where it has purchased a large plant. The output of this and the Standard Electric Time Co. plants will be sold by the Industrial Instrument Co., with home offices at Foxboro, Mass., and sales offices at 50 Church street, Hudson Terminal, New York, and 752 Monadnock Block, Chicago. The personnel of the enterprise includes men who have been well known for years as originators and manufacturers of industrial instruments, especially Messrs. B. R. Bristol, E. H. Bristol and W. E. Goodyear of Waterbury, Conn., for many years active in the Bristol Company. The Industrial Instrument Co.'s officers

are: President, Bennett B. Bristol, formerly secretary and treasurer of the Bristol Company; vice-president, Walter W. Patrick, until recently manager of the New York office of the Bristol Company; secretary, Henry P. Dennis, formerly manager of the Chicago office of the Bristol Company; treasurer, Arthur F. Mundy, secretary and general manager of the Standard Gauge Manufacturing Co.

The Smith-Courtney Company.

The Smith-Courtney Company of Richmond, Va., affords an illustration of an extensive enterprise developed from a meager beginning. It was founded in 1872 by George A. Smith, and afterwards there were several changes: First, from George A. Smith to Smith & Bragg, under which name it continued for a year, when it moved to 1419 East Main street; then the name was changed to George A. Smith, to Smith & Rader, to George A. Smith, and finally, in 1886, T. L. Courtney became interested and the name became fixed as the Smith-Courtney Company. In 1891 the company incorporated with George A. Smith president, T. L. Courtney vice-president, S. M. Price secretary and Gordon Wallace treasurer. In 1895 Mr. Courtney withdrew and Mr. Price was elected vice-president, and Mr. Wallace having withdrawn, T. B. Cannon was elected secretary-treasurer. In 1896 the company moved to 1418-1424 East Cary street, with Mr. Smith president, Mr. Price vice-president, H. Ellis, Jr., secretary and H. C. Boudar treasurer. In 1900 Mr. Price resigned and Mr. Ellis was elected vice-president and Mr. Boudar secretary-treasurer. The business has developed rapidly and reached such extensive proportions as to necessitate securing much-needed trackage facilities, so that on January 1, 1909, the company moved to its new quarters, 809-19 East Cary street, and has a large pipe warehouse at 908 East Cary street. This company carries one of the largest and most complete lines of railroad, mill, mine and factory supplies in the South Atlantic States, and, with its increased facilities, is now to handle large orders in the quickest possible time. It also deals in machinery of all kinds, this department being in charge of Malcolm B. Smith, a mechanical and civil engineer, formerly of the Lunkenheimer Company, Cincinnati. On February 11, 1908, the death of Mr. Smith, former president, and later, on the resignation of Mr. Ellis, vice-president, resulted in the election

Pelzer Mfg. Co. (S. C.)	169
Piedmont Mfg. Co. (S. C.)	175
Poe Mfg. Co. (S. C.)	125
Richland Cot. Mills (S. C.) Pfd.	45
Raleigh Cotton Mills (N. C.)	190
Roanoke Mills (N. C.)	168
Saxon Mills (S. C.)	118
Sibley Mfg. Co. (Ga.)	62 1/2
Spartan Mills (S. C.)	132
Springstein Mills (S. C.)	100
Tucapau Mills (S. C.)	135
Trilon Mfg. Co. (S. C.)	140
Union-Buttalo Mills (S. C.) 1st Pfd.	58 1/2
Victor Mfg. Co. (S. C.)	120
Warren Mfg. Co. (S. C.)	92
Warren Mfg. Co. (S. C.) Pfd.	100
Washington Mills (Va.)	25
Washington Mills (Va.) Pfd.	100
Whitney Mfg. Co. (S. C.)	104
Williamson Mills (S. C.)	125
Wiscasset Mills (N. C.)	125
Woodruff Cotton Mills (S. C.)	112
Woodside Cotton Mills (S. C.)	100

Quotations Furnished by William S. Glenn, Broker, Spartanburg, S. C., for Week Ending January 4.

Bid.	Asked.
Abbeville Cotton Mills (S. C.)	75
Aiken Mfg. Co. (S. C.)	82
American Spinning Co. (S. C.)	145
Anderson Cotton Mills (S. C.)	65
Arcadia Mills (S. C.)	90
Arkwright Cotton Mills (S. C.)	109
Augusta Factory (Ga.)	65
Avondale Mills (Ala.)	110
Belton Mills (S. C.)	116
Brandon Mills (S. C.)	135
Cabarrus Cotton Mills (N. C.)	120
Chadwick Mfg. Co. (N. C.) Pfd.	103
Chillicothe Mfg. Co. (S. C.)	127
Clifton Mfg. Co. (S. C.)	101
Clifton Mfg. Co. (S. C.) Pfd.	99
Clinton Cotton Mills (S. C.)	105
Columbia Mfg. Co. (Ga.)	98
Courtenay Mfg. Co. (S. C.)	97
Dallas Mfg. Co. (Ala.)	90
Darlington Mfg. Co. (S. C.)	70
Converse Co., D. E. (S. C.)	112
Drayton Mills (S. C.)	100
Dugle & Phoenix Mills (Ga.)	120
Eastley Cotton Mills (S. C.)	145
Enoree Mfg. Co. (S. C.)	69
Enoree Mfg. Co. (S. C.) Pfd.	100
Enterprise Mfg. Co. (Ga.)	82
Exposition Cotton Mills (Ga.)	240
Gaffney Mfg. Co. (S. C.)	65
Galnesville Cotton Mills (Ga.)	50
Granby Cot. Mills (S. C.) 1st Pfd.	105
Graniteville Mfg. Co. (S. C.)	160
Greenwood Cotton Mills (S. C.)	45
Grendel Mills (S. C.)	109
Hartsville Cotton Mill (S. C.)	125
Henrietta Mills (N. C.)	160
Inman Mills (S. C.)	105
Lancaster Cotton Mills (S. C.)	110
Lancaster Cot. Mills (S. C.) Pfd.	91
Langly Mfg. Co. (S. C.)	91
Laurens Mills (S. C.)	148
Limestone Mills (S. C.)	141
Lockhart Mills (S. C.)	95
Lockhart Mills (S. C.) Pfd.	95
Loray Cotton Mills (N. C.) Pfd.	90
Marlboro Cotton Mills (S. C.)	80
Mills Mfg. Co. (S. C.)	100
Molokoh Mfg. Co. (S. C.)	95
Monaghan Mills (S. C.)	115
Monarch Cotton Mills (S. C.)	98
Newberry Cotton Mills (S. C.)	145
Ninety-Six Cotton Mills (S. C.)	115
Norris Cotton Mills (S. C.)	120
Odell Mfg. Co. (N. C.)	90
Olympia Cotton Mills (S. C.)	68
Orr Cotton Mills (S. C.)	104
Pacolet Mfg. Co. (S. C.)	160
Pacolet Mfg. Co. (S. C.) Pfd.	97
Pelzer Mfg. Co. (S. C.)	168
Piedmont Mfg. Co. (S. C.)	175
Poe Mfg. Co. (S. C.)	125
Saxon Mills (S. C.)	118
Sibley Mfg. Co. (Ga.)	62
Spartan Mills (S. C.)	130
Trilon Mfg. Co. (Ga.)	132
Tucapau Mills (S. C.)	205
Union-Buttalo (S. C.) 1st Pfd.	60
Victor Mfg. Co. (S. C.)	122
Warren Mfg. Co. (S. C.)	92
Washington Mills (Va.)	25
Washington Mills (Va.) Pfd.	100
Whitney Mfg. Co. (S. C.)	110
Wiscasset Mills (N. C.)	125
Woodruff Cotton Mills (S. C.)	122
Woodside Cotton Mills (S. C.)	104
Watts Mills (S. C.)	90
Williamson Mills (S. C.)	101

Savings Bank Reports.

The Provident Savings Bank of Baltimore, in its statement for the year ended December 31, 1908, shows: Funds on hand \$4,472,792, as compared with \$4,384,331 a year ago. This increase in funds is notwithstanding a decrease in the number of accounts open, the total of these now being 46,987, as compared with 47,968 a year ago. There was received from depositors during the year \$2,668,873 and income from investments \$194,519, making a total of \$2,863,392. There was paid to depositors during the year \$2,724,129.

The German Savings Bank of Baltimore reports for the year ended December 31, 1908, net funds on hand \$4,157,416, as compared with \$4,090,781 a year ago. Although the number of accounts open decreased during the year, the funds showed an increase, the accounts open now numbering 8005, while a year ago they were 8192. There was received from depositors during the year \$1,868,650, and interest from investments and premium on bonds sold \$198,789. There was paid depositors \$1,946,707.

New Corporations.

Alpharetta, Ga.—Reports state that the Alpharetta Bank of Milton county has made application for a charter; capital \$25,000.

Augusta, Ga.—The Realty Investment Co., capital \$5000, has filed application for a charter. The incorporators are D. G. Fogarty, T. G. Philpot and John L. Armstrong.

Birmingham, Ala.—The City Bank & Trust Co. has filed articles of incorporation; capital \$100,000. The officers are B. T. Head, president; S. P. King, vice-president; R. C. Head, secretary and treasurer; directors, Thomas Boggess, E. G. Cole, W. E. Spink, R. A. Brown and T. J. Carson.

Bokchito, Okla.—The Citizens' State Bank has been incorporated with \$15,000 capital by A. W. Carter, C. L. Sawyer, W. E. Riddle and M. M. Smith of Bokchito, and E. W. Frey of Amber.

Huntersville, N. C.—The Odd Fellows Investment Co. has filed its charter; capital \$25,000. The incorporators are G. H. Brown, W. C. McAuley, J. E. Shell and W. S. Caldwell.

Chilton, Texas.—The First State Bank of Chilton has been chartered with \$20,000 capital by G. W. Riddle, Dallas; L. A. Speer, Arthur Mauldin, Gordon Gaither, Chilton.

Coldwater, Tenn.—The Bank of Coldwater, capital \$15,000, has been incorporated by D. H. Patterson, W. C. Suggs, J. B. Cheatham, R. E. Commons, Rufus Smith, A. G. Hayes, C. E. George and T. D. Summers.

Danville, Va.—The American National Bank, capital \$100,000, has organized with the following directors: H. O. Kerns of Southerlins, president; W. H. Barker, cashier; John B. Anderson, W. P. Hodnett, W. E. Gardner, Chalmers Patterson and Charles E. Hughes, all of Danville; J. M. Marshall of Witt, S. R. Harper of Dry Fork, J. W. Gregory of Luck, and W. H. Wilson of Ringgold.

East Bend, N. C.—The Yadkin Valley Bank is reported being organized with \$7500 capital by J. A. Martin, W. N. Horn, W. G. Leake, J. O. Huff, J. T. Smithman, J. N. Miller, W. H. Speas, W. A. Martin, J. H. Martin and J. L. Norman, all of East Bend, and R. B. Horn, J. T. Benbow and E. P. Horn of Winston-Salem.

Fort Worth, Texas.—Reports state that on February 1 a State bank capitalized at \$100,000 is to be opened. O. S. Houston and W. L. Smallwood, who conduct a private bank, are said to be the organizers.

Greenwood, S. C.—A. F. McKissick, James Self and others are reported interested in a movement to organize a building and loan association.

Joiner, Ark.—The Bank of Joiner, capital \$10,000, has filed articles of incorporation. The incorporators are E. Ralph, president; J. B. Wilson, vice-president; J. B. Musick, secretary and treasurer; S. C. Dunn, George Hill, J. C. O'Bryan, J. W. Fonville and A. N. Higgins.

Lincoln, Mo.—The People's Bank, capital \$25,000, has been incorporated by J. W. Faler, W. A. Hartle, John F. Balke and others.

Mannsville, Okla.—The First State Bank has been authorized to begin business; capital \$15,000. The incorporators are L. E. Covey, president; C. M. Ritchey, vice-president; E. N. Wolverton, cashier, all of Mannsville, and J. A. Bivens of Ardmore. This is a conversion of the First National Bank.

Millport, Ala.—The Millport State Bank has filed articles of incorporation; capital \$15,000. The incorporators are H. H. Strickland, A. K. Collins, Garfield Brown and others.

Mooringsport, La.—Reports state that a bank is to be opened in charge of W. H. B. Croom.

New Orleans, La.—The Fidelity Homestead Co. has been chartered with an authorized capital of \$5,000,000. The directors are M. A. Sporl, Oscar Schumert, E. Dreifus, M.D., S. H. Meyer, Julius Cohn, Frank Bethune, George F. Maier, Charles De Bartolo, Alex. O'Donnell, J. C. Hillingsworth, Meyer S. Dreifus, Nathan Kohlman, George I. Langhoff, Gallier, Capdevielle, T. J. Byrnes and H. H. Hinrichs.

Oklahoma City, Okla.—The Lee Investment Co. has been incorporated with \$100,000 capital by O. G. Lee, A. Goodholm, E. F. Sparrow, H. E. Lee and A. P. Crockett.

Portsmouth, Va.—The First National Bank is reported to have begun business; capital \$100,000. John L. Watson is president, and V. Garland Weaver, cashier.

Prairie Hill, Mo.—The Farmers & Merchants' Bank has been incorporated with \$10,000 capital by H. Wright, C. V. Stodgill, Lee Hocker and others.

Rogersville, Mo.—The Citizens' Bank has been incorporated with \$10,000 capital by W. D. Delzell, W. T. Breedlove, W. L. Rush and others.

Sandersville, Miss.—The Union and Farmers' Bank, capital \$50,000, will, it is stated, begin business about February 1 with the following directors: W. C. Trest, president; W. E. Ramsey, vice-president; H. H. Mitchell, cashier; W. C. Hinton, N. Batson, J. R. Freeman, D. T. Shoemaker, R. L. Hardee, J. C. Smith, O. Williams, H. J. Weems.

Savannah, Ga.—The Audit Company of Georgia has been incorporated with \$5000 capital by Edward A. Richmond, Frank C. Richmond, Robert S. Cope and Charles Franklin.

St. Louis, Mo.—The N. B. C. Realty & Investment Co., capital \$30,000, has been incorporated by John Nickerson, Charles Hamilton, W. B. Cowan and others.

Sulphur, Okla.—The Security Mortgage Co., capital \$50,000, has been incorporated by R. F. Marlow, G. W. Marlow and G. M. Nicholson of Sulphur; J. W. Marlow of Hickory and Charles Plato of Chickasha.

Tennille, Ga.—The People's Exchange Bank has been granted a charter; capital \$30,000. The organizers are J. Bashinski, G. H. Wood and H. M. Bashinski.

Weatherford, Texas.—The Merchants and Farmers' State Bank of Weatherford has been incorporated with \$100,000 capital by W. H. Eddleman, Fort Worth; H. L. Brevard, J. W. Brazelton, W. L. Tucker, Weatherford. This is a conversion of the Merchants and Farmers' National Bank.

New Securities.

Andrews, N. C.—The MANUFACTURERS' RECORD is informed that the Highway Commission of Valleytown proposes to issue \$25,000 in bonds to macadamize roads. J. Q. Barker, Andrews, is president of the commission.

Cherokee, Okla.—Reports state that the \$35,000 of school district bonds have been purchased by the Alfalfa County National and the First National banks of Cherokee.

Chattanooga, Tenn.—A bill is to be introduced in the Hamilton County Court by the School Board asking for a bond issue to meet existing financial deficits amounting to several thousand dollars.

Decatur, Ark.—The State Bank of Siloam Springs, Ark., is reported to have purchased \$5000 of school bonds.

Duncan, Okla.—The city has voted \$46,000 of water-works and City Hall and \$10,000 of school-building bonds.

Enid, Okla.—All bids received December

19 for \$125,000 of water and \$125,000 of sewer 5 per cent. 25-year bonds are reported to have been rejected.

Fayette, Miss.—Reports state that no sale was made December 15 of \$1800 of 6 per cent. electric-light and water bonds.

Kiowa, Okla.—An issue of \$38,000 of water-works bonds has been voted.

Greensboro, N. C.—Bids will be received by John L. King, chairman Highway Commission, until noon January 18 for \$55,000 of 5 per cent. Guilford county highway improvement bonds.

Hamlin, Texas.—The city has voted bonds for water-works.

Hot Springs, Ark.—The Wm. R. Compton Bond & Mortgage Co. of St. Louis is, it is stated, the purchaser of the \$10,000 of 6 per cent. 10-15-year school district bonds recently reported sold.

Johnson City, Tenn.—It is probable that \$50,000 of school bonds will be issued.

Knoxville, Tenn.—Reports state that bills are to be introduced in the Legislature providing for \$150,000 of high school, \$50,000 of parks and \$250,000 of railroad refunding bonds. Address the Mayor.

Knoxville, Tenn.—Local reports state that a bill will probably be introduced in the Legislature providing for \$500,000 of Knox county road bonds.

Marceline, Mo.—The Fidelity Trust Co. of Kansas City, Mo., is reported to have purchased at par \$50,000 of 5 per cent. 10-20-year water-works bonds.

McAlester, Okla.—Reports state that an election is to be held January 19 to vote on \$175,000 of sewer, \$20,000 of water extension and \$8000 city jail bonds.

Memphis, Tenn.—Press reports state that the \$1,000,000 of 4 per cent. refunding bonds, for which bids were asked December 28, were not sold.

New Orleans, La.—Local reports state that the Sewerage and Water Board will place on the market next February \$8,000,000 of bonds.

Paris, Texas.—A Chicago firm has been awarded at \$1527 premium \$25,000 of paving bonds.

Rocky Mount, Va.—J. F. Rison, president of the Commercial Bank of Danville, and Col. E. S. Reid, cashier of the Chatham Savings Bank, have been awarded \$98,000 of 5 per cent. bonds.

Shandon, P. O. Columbia, S. C.—It is reported that \$10,000 of school district bonds have been voted.

Shawnee, Okla.—The city has voted \$125,000 of sewer, \$120,000 of school, \$50,000 of convention hall and \$20,000 of hospital 5 per cent. 20-year bonds.

Sligo, Texas.—The State is reported to have purchased \$1500 of 4 per cent. 5-20-year Yoakum county courthouse bonds.

Triadelphia, W. Va.—An election is to be held, probably January 23, to vote bonds for school building.

Vinita, Okla.—An election is to be held February 9 to vote on \$28,001 of bonds to buy the Auditorium Building, to be used as City Hall.

Texarkana, Texas.—It is reported that the \$250,000 of good-roads bonds of Precinct No. 1 have been declared void, owing to technicalities. It is stated another election will probably be ordered.

Texarkana, Texas.—The city has voted \$125,000 of high-school building, \$5500 of jail, \$2000 of fire station and \$3500 of street-improvement bonds.

West End, Ala.—Steiner Bros. of Birmingham have purchased at a premium of \$2100 the \$25,000 of school and \$10,000 of fire department 5 per cent. 20-year bonds.

Williamsburg, Ky.—Bids will be received until 7.30 P. M. January 15 for \$19,000 of graded school bonds of the city of Williamsburg, interest not to exceed 6

[For Additional Financial News, See Pages 172, 174, 176 and 177.]

